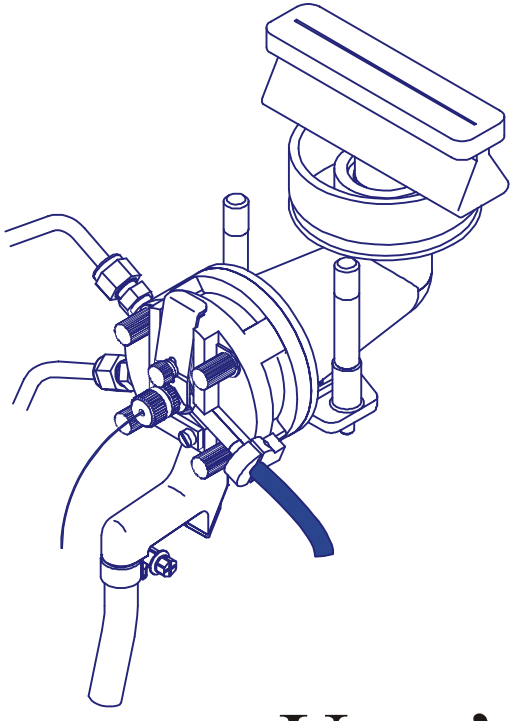
Burner System

For AAnalyst Atomic Absorption Spectrometers



User's Guide

PerkinElmer™
instruments.

Burner System

For AAnalyst Atomic Absorption Spectrometers

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CE

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Introduction

The guides provided with your analytical instrument contain information and warnings that you must follow to ensure safe operation and to maintain the instrument in a safe condition. This advice is intended to supplement, not supersede, the normal safety code of behavior prevailing in the country of operation.

General safety practices for atomic spectroscopy and potential hazards with various atomic absorption techniques are described in the *User's Guide* for the atomic absorption spectrometer. Please refer to that guide before you operate the system.
The information provided does not cover every safety procedure that should be practiced. Ultimately, maintenance of a safe laboratory environment is the responsibility of the user and the user's organization.

Correct use of analytical instruments

Before you install or use your instrument, and in order to get the best results, you should be familiar with all of the instruments in the system and know how to operate them. You should also be aware of the safety procedures in force in your laboratory, especially those concerning atomic spectroscopy instruments. Read the guides supplied with the instruments before you start.

If you use the instrument in a manner not specified in the guides, or if you use it for a purpose other than that intended, you may damage the instrument, or compromise your own, or someone else's, safety.

Analytical instruments should only be operated by persons who are suitably qualified and have received adequate training.

Warning markings on the burner system

A

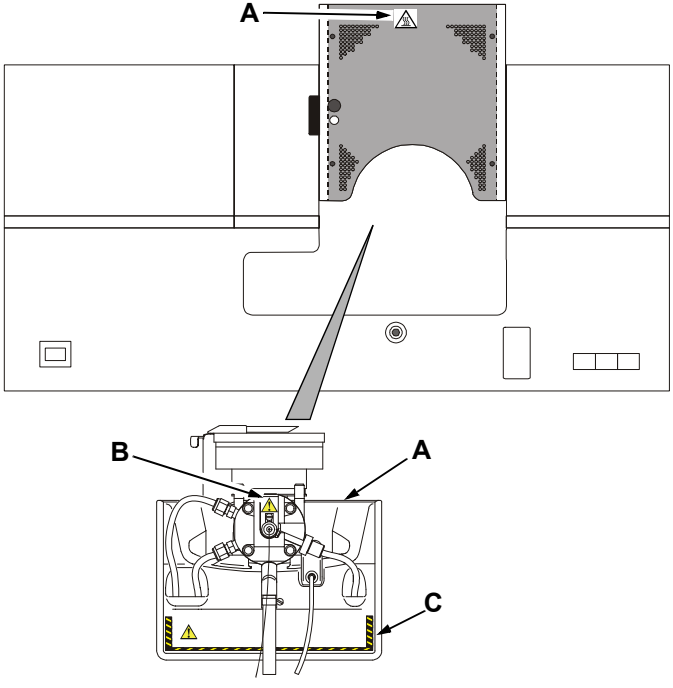
Risk of hot surfaces
Risque de surfaces chaudes
Gefahr durch heiße Oberflächen

B

Nebulizer clamp must be lowered and locked over the nebulizer flange

La pince du nébuliseur doit être abaissée et verrouillée audessus de la bride du nébuliseur

Die Zerstäuber-Befestigungsplatte muß nach unten geschoben und über dem Flansch des Zerstäubers befestigt sein.



Burner system

C

Warning: Moving Parts – Risk of Injury
Some moving parts of the instrument are accessible in normal operation.
Keep hands, clothing and other objects away from the moving parts of the instrument.

Danger: Parties en mouvement – Risque d'accident corporel
Certaines parties en mouvement de l'instrument sont accessibles en fonctionnement normal.
Tenir les mains, vêtements et autres objets éloignés des parties en mouvement de l'instrument.

Warnung: Bewegliche Teile – Verletzungsgefahr
Bei normalem Betrieb sind bewegliche Teile des Geräts zugänglich.
Hände, Kleidung und andere Gegenstände von den beweglichen Teilen des Geräts fernhalten.

Burner System: Preparing for Analyses

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Atomizer compartment door

Raising and lowering the door

Perform the steps below to raise or lower the atomizer compartment door:

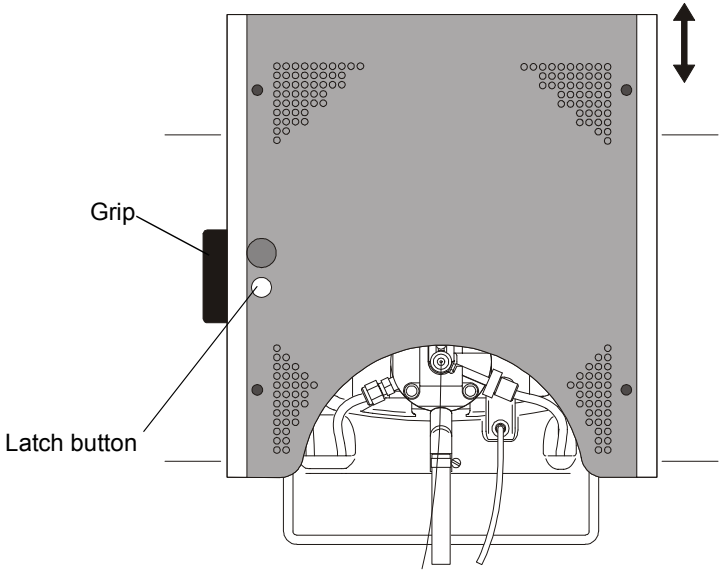


Figure 2-1. Raising or lowering the atomizer compartment door

1. Place the fingers of your left hand behind the grip and press the latch button with your thumb.
2. Keeping the latch button pressed in, raise or lower the atomizer compartment door to the end stop, preferably holding the door with both hands.
   You can also leave the door in any intermediate position when you release the latch button.

W3.4

Warning: UV Radiation – Risk of Eye Damage

The flame, especially the nitrous oxide-acetylene flame, may emit UV radiation which can damage your eyes.

- *Keep the door closed when the flame is burning, unless you need to adjust the burner as described in the user documentation.*
- *Always wear UV-absorbing safety glasses when looking at the flame.*

Removing and refitting the door

To perform procedures in the atomizer compartment, you may find it more convenient to remove the atomizer compartment door. Follow the steps below to remove and refit the door.

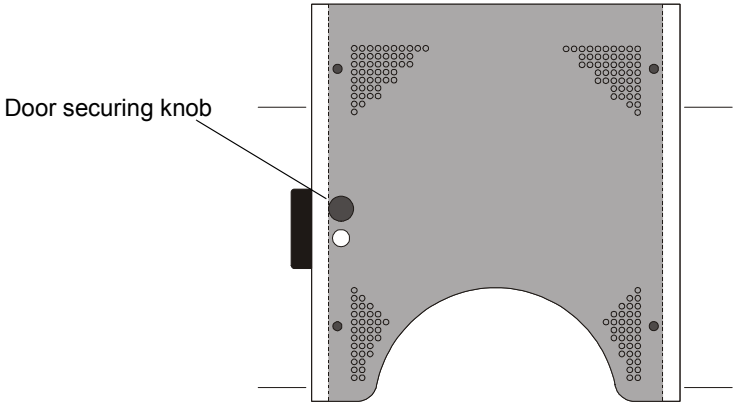


Figure 2-2. Removing the atomizer compartment door

To remove the door:

1. Slide the door to the lowest position.
2. Unscrew the door securing knob.
3. Carefully pull the 2 door pins out of the door slide on the left-hand side.
4. Pull the door retainer strip out of the door slide on the right-hand side.
   Removal is complete.

To refit the door:

1. Insert the door retainer strip into the slot in the door slide on the right-hand side.
2. Slide the door up or down until the 2 door pins line up with the holes in the door slide on the left-hand side.
   Push the pins into the holes.
3. Screw in the door securing knob.
   Refitting is complete.

Setting up the system for analyses using the flame technique

Summary of the procedure:

1. Switch on the system (*see 'Switching on the system' in the Spectrometer User's Guide*).
2. If necessary, move the burner system into the atomizer compartment (*procedure: page 2-6*).
3. Create or open a method (*see the Online Help in AA WinLab*).
4. If you intend to make emission measurements, in the **Method Editor** on the **Inst** page, for **Signal Type**, select **Emission**.
5. If you intend to make absorption measurements, install the lamps that you require (*see 'Installing lamps' in the Spectrometer User's Guide*).
6. Set up the burner system (*procedure: page 2-7*).
7. Perform the safety checks (*see page 2-20*).
8. Ignite the flame (*procedure: page 2-21*).

You should now set up the nebulizer, then optimize the burner and nebulizer before checking the sensitivity. Refer to the *Online Help* in AA WinLab.

Selecting the atomizer

If the atomizer you require is not currently located in the atomizer compartment, follow the steps below to move it into the compartment:

W9.1

Warning: Moving Parts – Risk of Injury

Some moving parts of the instrument are accessible in normal operation.

- *Keep hands, clothing and other objects away from the moving parts of the instrument.*

1. Make sure that the furnace autosampler is swivelled from in front of the atomizer compartment to the standby position at the right, and that the nebulizer sample tube is not connected to an external accessory.
2. Make sure that the air supply is turned on since this provides the hydraulic pressure required to change the atomizers.
3. In the **File** menu, click on **Change Technique**

   –or–

   On the **Toolbar**, click on **Technique**.
   The Select Technique dialog appears.
4. Select the atomizer that you require:
   Flame for the burner system.
   Furnace for the graphite furnace.
5. Click on **OK**.

The system changes over the atomizers. Further information on changing the atomizer is also provided in the *Online Help* in AA WinLab.

Note: *While the atomizers are being changed, do not put your hands or other objects into the atomizer compartment.*

Setting up the burner system

Summary of the procedure:

1. Install the correct burner head for the type of flame that you intend to use – air-acetylene or nitrous oxide-acetylene (*procedure: page 2-8*).
2. Make sure that the correct nebulizer is installed – the standard nebulizer or a corrosion-resistant nebulizer (*procedure: page 2-10*).
3. If you want to use the flow spoiler, make sure that it is correctly installed (*procedure: page 2-15*).
4. If you want to use an impact bead, make sure that it is correctly installed (*procedure: page 2-15*).
5. If you intend to aspirate organic solvents, make sure that the correct gasket is fitted in the burner system (*procedure: page 2-17*).
6. Perform the safety checks (*see page 2-20*).
7. Ignite the flame (*procedure: page 2-21*).

Note: *Correct procedures for extinguishing the flame are described on page 3-7.*

Changing a burner head

If the burner head currently fitted to the burner system is not suitable for your planned analyses, change it as described below. The available burner heads are described on page 5-7.

To remove the burner head:

W4.2

Warning: High Temperatures – Risk of Burns

The burner head can reach very high temperatures.

- *Do not touch the burner head until it has cooled to room temperature.*

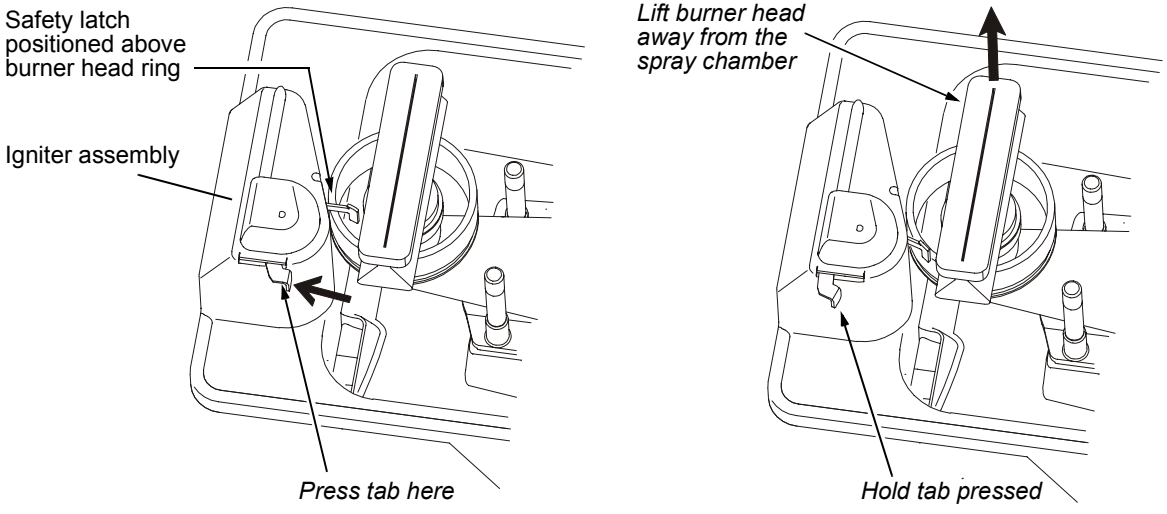

Safety latch positioned above burner head ring
Igniter assembly
Press tab here
Lift burner head away from the spray chamber
Hold tab pressed

Figure 2-3. Removing the burner head

1. Where applicable, extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head:
    1. Press and hold the tab on the safety latch located on the igniter assembly.
    2. Gently pull and twist the burner head in an upward direction until it comes out of the neck of the spray chamber.

To install a burner head:

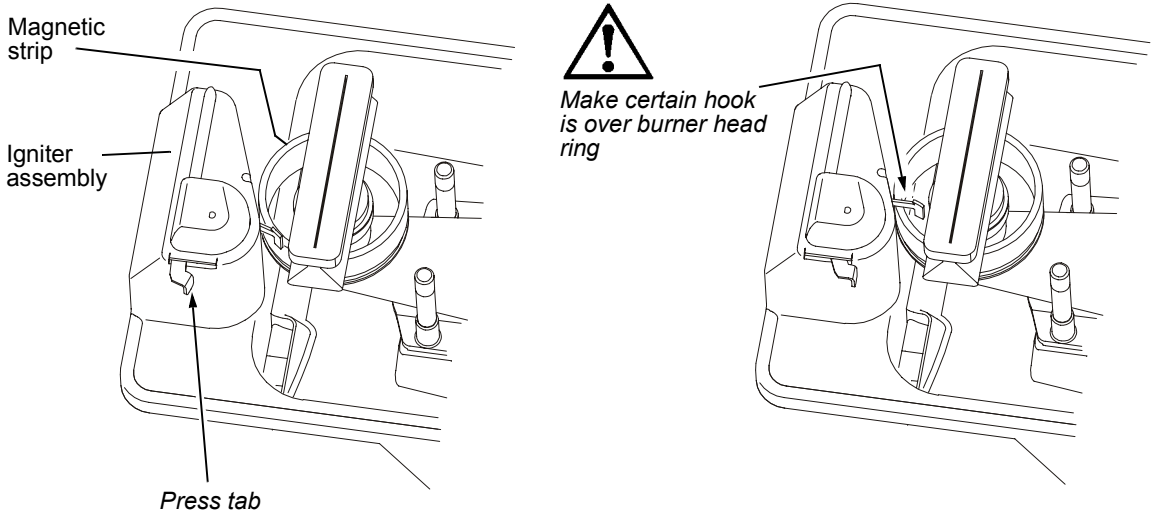


Figure 2-4. Installing and latching the burner head

1. Press and hold the tab on the safety latch located on the igniter assembly.
2. Hold the burner head so that the magnetic strip on the burner head ring is at the back, facing the igniter assembly.
3. Insert the stem of the burner head into the neck of the spray chamber and gently push it down with a slight twisting action until it bottoms in the neck of the spray chamber.
4. Release the safety latch.
   Make absolutely certain that the 'hook' on the latch is positioned over the burner head ring.
5. Swing the igniter arm carefully by hand over the burner head to check that it does not strike the burner head.
6. Carefully rotate the burner head to align the appropriate positioning notch with the arrow on the spray chamber.
7. Refit the atomizer compartment door (*procedure: page 2-4*).

This completes installation of the burner head. You should now set up the nebulizer, then optimize the burner and nebulizer before checking the sensitivity. Refer to the *Online Help* in AA WinLab.

Changing the nebulizer

If the nebulizer installed in the burner system is not suitable for your planned analyses, change it as described below (for example, the standard nebulizer is installed and you require the corrosion-resistant nebulizer).

To remove the nebulizer:

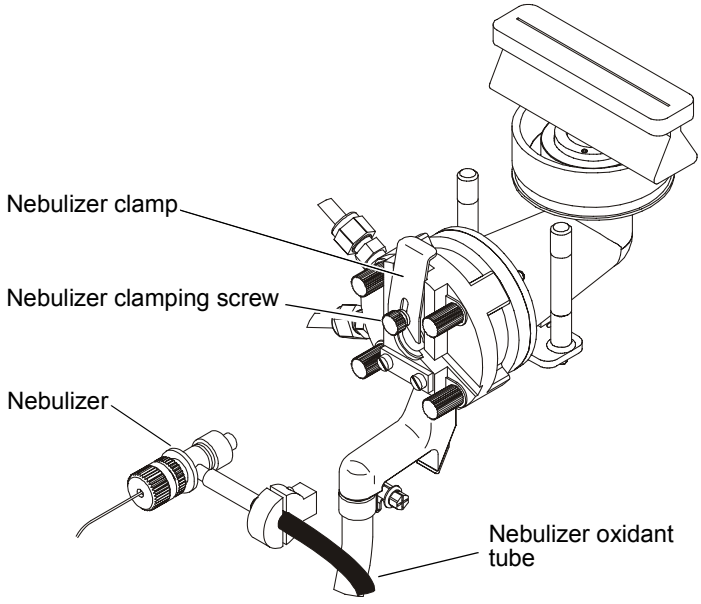


Figure 2-5. Removing the nebulizer

1. Where applicable, extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).

3. Remove the nebulizer from the burner end cap:
   1. Slacken the nebulizer clamping screw.
   2. Lift up and hold the nebulizer clamp.
      Very gently rock the nebulizer a few times to make sure that it is not sticking in the end cap.
   3. Carefully pull the nebulizer out of the end cap.
   4. Make sure that you remove the venturi O-ring with the nebulizer.
      If the O-ring remains lodged in the burner end cap, use a plastic or wooden probe to dislodge it.
4. Using a 2 mm Allen wrench, undo the two screws that retain the black magnet assembly on the nebulizer side arm.
   Take care not to lose the screws.
5. Pull the nebulizer oxidant tube from the side arm with a rocking motion.

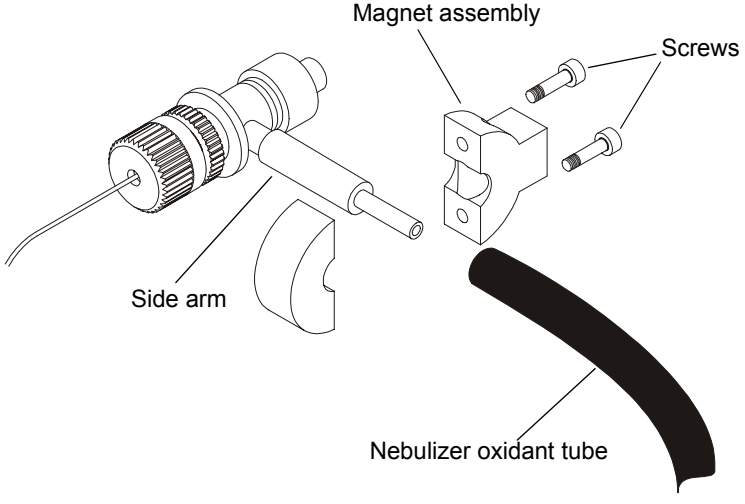


Figure 2-6. Removing the nebulizer oxidant tube

To install the nebulizer:

W5.10

Warning: Flammable Gases – Fire and Explosion Hazard

The use of the wrong type of nebulizer for your burner system may result in a seepage of fuel gas which is a serious fire hazard.

- *Use only the nebulizers specified for the burner system.*

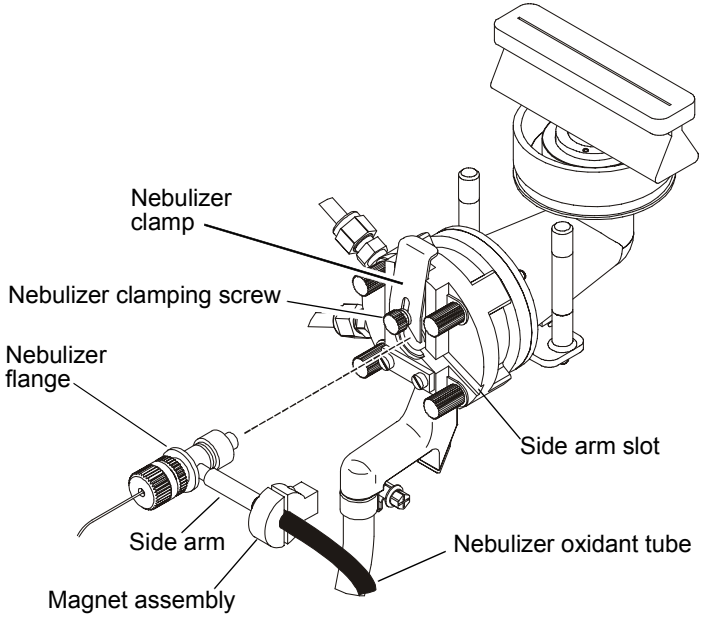
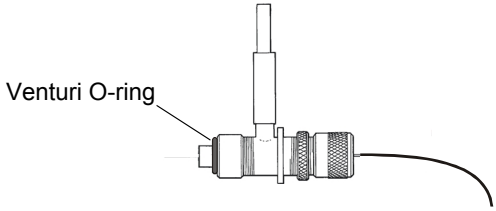


Figure 2-7. Installing the nebulizer

1. If you need to fit a new sample tube to the nebulizer, refer to page 3-27, step 9.
2. Connect the nebulizer oxidant tubing:
   1. Push the nebulizer oxidant tube onto the nebulizer side arm.
   2. Replace the black magnet assembly on the side arm and tighten the two securing screws (refer to Figure 2-6).
      The magnet assembly serves to clamp the oxidant tube on the side arm and also contains the magnet that activates the nebulizer interlock.
3. Before you install the nebulizer, verify that the O-ring on the venturi is properly located and in good condition. If it appears damaged, replace it. Never install a nebulizer without a correctly fitted O-ring.



4. Install the nebulizer in the burner end cap:
    1. Lift up and hold the nebulizer clamp.
    2. Holding the nebulizer with the side arm to the right, insert the nebulizer into the port in the end cap.
    3. Push the nebulizer into the end cap as far as it will go. The nebulizer side arm must be located in the slot in the end cap.
    4. Lower the nebulizer clamp, making sure that it locks **over** the nebulizer flange, and then tighten the nebulizer clamping screw.
    5. Pull on the nebulizer gently to make sure that the nebulizer clamp is properly engaged.
    6. Make sure that the magnet assembly fits snugly alongside the burner end cap and that the magnet is facing the nebulizer interlock sensor (*see Figure 2-9*).

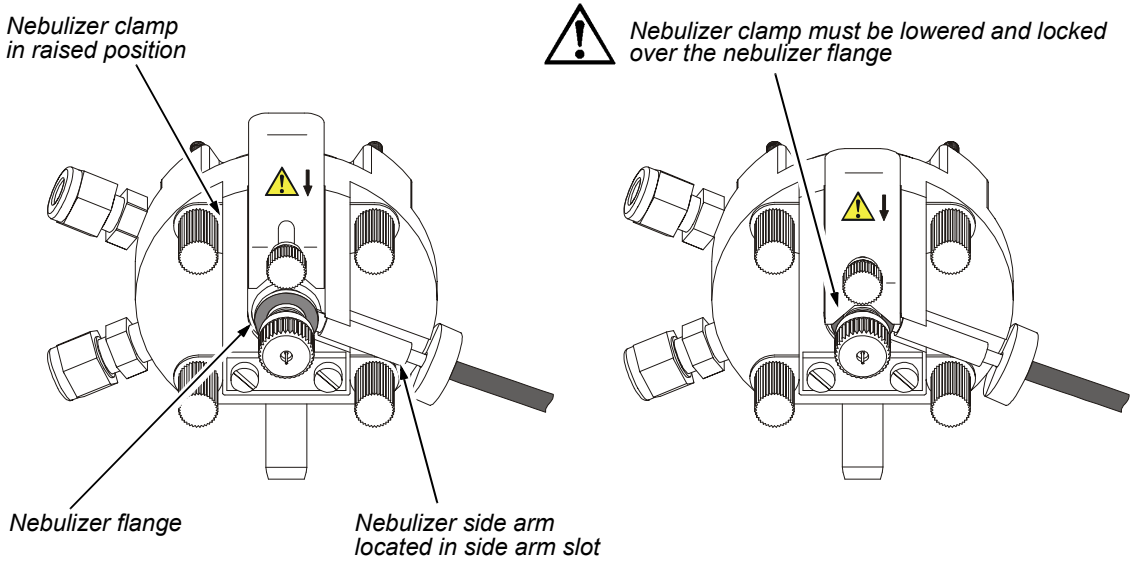


Figure 2-8. Securing the nebulizer

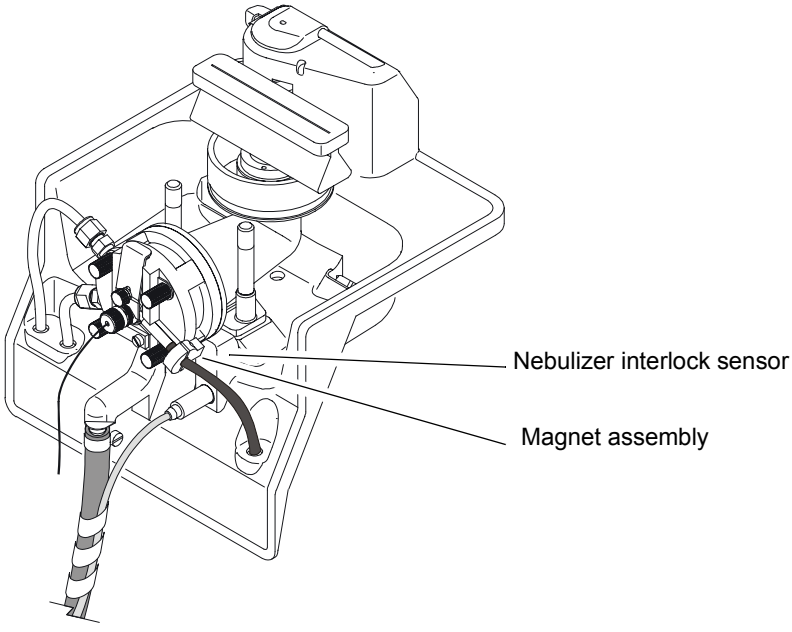


Figure 2-9. Aligning the magnet assembly

This completes installation of the nebulizer. You should now set up the nebulizer, then optimize the burner and nebulizer before checking the sensitivity. Refer to the *Online Help* in AA WinLab.

Flow spoiler and impact bead

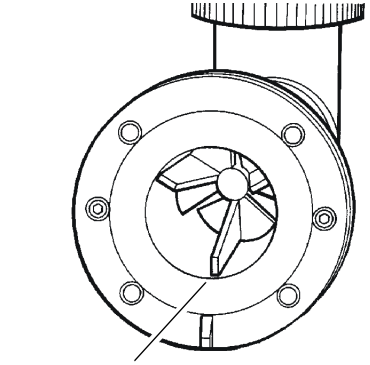
If you wish to install a flow spoiler of impact bead, or check that these components are correctly installed, follow the steps below:

Remove the burner end cap:

1. Where applicable, extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. If corrosive or toxic samples were run previously, pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the inside and the drain system.
5. Remove the burner end cap:
    1. Unscrew the four thumbscrews holding the end cap to the spray chamber.
    2. Carefully allow the end cap to hang down (you do not need to disconnect any of the hoses).

Install the flow spoiler:

1. Slide the cleaned flow spoiler fully back into the spray chamber such that one of the vanes is in the “six o’clock” position.
   Press the center of the flow spoiler with your index finger and push it in until it is firmly seated.

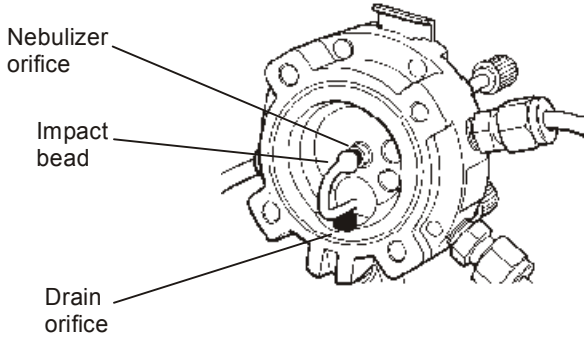


Install the impact bead:

The stem of the impact bead is seated in a small hole on the inside of the burner end cap, just above the drain orifice.

1. Moisten the stem of the impact bead with water for easier installation.
2. Carefully hold the stem of the impact bead and press it firmly through the two O-rings inside the hole until it bottoms in the seat.
   Do not press on the bead itself – hold it only by the stem to prevent breakage.

   If sample residues have partially filled the end cap hole, you may not be able to seat the impact bead. Then, remove the retaining plate and clean the hole as described on page 3-15.
3. Carefully rotate the stem to center the bead on the nebulizer orifice as shown below.



Reassemble the burner system:

Reassemble the burner system as described in *'Reassembling the burner system'* on page 3-16.

Installing solvent-resistant components in the burner

The standard O-ring in the burner end cap is not resistant to organic solvents. If you intend to aspirate solutions containing organic solvents you must exchange this O-ring for a solvent-resistant O-ring.

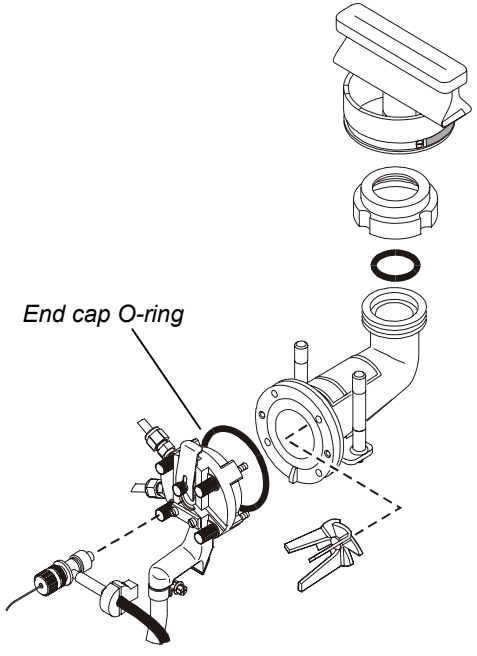
1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. If corrosive or toxic samples were run previously, pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the inside and the drain system.
5. Remove the nebulizer from the burner end cap (*procedure: page 2-10*) and carefully allow it to hang down.
6. Remove the burner end cap:
   1. Unscrew the four thumbscrews holding the end cap to the spray chamber.
   2. Carefully allow the end cap to hang down.
7. Remove the O-ring from the groove in the end cap (*see Figure 3-3*).
8. Carefully fit the **fragile** Corkpreen gasket (0047-2014) or the Kalrez® O-ring (0992-1044) in the groove.
9. Place the end cap against the spray chamber and tighten the four thumbscrews.
   Tighten them until they are finger-tight in the sequence:
   top right, bottom left, bottom right, top left.
10. Reinstall the burner head (*procedure: page 2-9*) and the nebulizer (*procedure: page 2-12*).

Warning: Flammable Gases – Fire and Explosion Hazard

Not all gaskets in the burner unit are suitable for use with organic solvents. Exposure to such solvents may cause the respective gaskets to swell. This may result in a seepage of gas which is a serious fire hazard.

- *Before you aspirate organic solutions, remove the respective gaskets and install solvent-resistant gaskets.*

Exchange this O-ring before aspirating organic solvents:



Adding water to the drain trap

The drain vessel includes an internal trap to make certain that burner gases cannot escape into the drain vessel (*more information: page 5-9*). Enough water must be present in the drain system to fill the drain loop and to activate the drain float. If not, carry out the following procedure:

1. Remove the atomizer compartment door (*procedure: page 2-4*).
2. Remove the burner head (*procedure: page 2-8*).
3. Pour about 250 mL deionized water slowly through the neck of the spray chamber to fill the drain trap and activate the drain float.
4. Reinstall the burner head (*procedure: page 2-9*).
5. Refit the atomizer compartment door (*procedure: page 2-4*).

Safety checks

Before igniting the flame, always make sure that:

- The fume ventilation system for the laboratory is switched on.
- The burner head is correctly installed and the end cap is secured.
- The correct nebulizer is fitted and that it is correctly secured.
- The correct gaskets are fitted in the burner system.
- The fuel and oxidant hoses are correctly fitted to the burner system.
- The drain system is installed and operating correctly.
- The door of the atomizer compartment is in the closed position.
- All safety interlocks are correctly closed.

If the interlocks are not closed, one or more of the following may be the cause:

– The burner head, the nebulizer, or the drain system is not correctly installed.
– The acetylene or oxidant pressure is too low.
– The liquid level in the drain trap is too low.
– The liquid level in the drain vessel is too high.

Igniting the flame

W5.3

Warning: Flammable Gases – Fire and Explosion Hazard

- *Before you ignite the flame, set up your spectrometer and burner correctly and observe all the safety precautions described in your spectrometer handbook.*

Note: *In an emergency, switch off the spectrometer using the operational on/off switch on the front panel.*
The flame is automatically extinguished and the gases shut down in a safe sequence.
See page 2-23 for the procedure to follow after an emergency shutdown.

To ignite the flame:

1. Switch on and set up the spectrometer system (*see 'Setting up the system for analyses using the flame technique', page 2-5*).
2. Perform the safety checks (*see page 2-20*).
3. Adjust the outlet gauge pressures of the burner gases to the recommended values (*see Table 2-1 on page 2-22*).
4. On the **Toolbar**, click on **Flame**.
   The Flame Control window appears.
5. Select the oxidant:
   In the **Flame Control** window, click on **Air** or **N2O**.
6. Ignite the flame:
   In the **Flame Control** window, click on **Flame On/Off**.

The correct procedure to extinguish the flame is described on page 3-7.

W3.4

Warning: UV Radiation – Risk of Eye Damage

The flame, especially the nitrous oxide-acetylene flame, may emit UV radiation which can damage your eyes.

- *Keep the door closed when the flame is burning, unless you need to adjust the burner as described in the user documentation.*
- *Always wear UV-absorbing safety glasses when looking at the flame.*

Select an air-acetylene flame:

- If you are setting up the burner system.
- If you have installed a different nebulizer, cleaned the nebulizer, or if the settings on the nebulizer have been altered since it was last used.
- If you are using the flame to heat the QTA-cell.

W5.1

Warning: Flashback Hazard

- *Never set up the nebulizer using a nitrous oxide-acetylene flame.*
- *Set up the nebulizer using an air-acetylene flame only, and make small adjustments slowly.*

Table 2-1. Required Pressures for the Burner Gases

Gas	Outlet Gauge Pressure					
	kPa		bar		psig	
	P_{min}	P_{max}	P_{min}	P_{max}	P_{min}	P_{max}
Acetylene (C_2H_2)	90	100	0.9	1.0	13.0	14.5
Air	450	500	4.5	5.0	65.0	72.5
Nitrous oxide (N_2O)	450	500	4.5	5.0	65.0	72.5

- Set the outlet gauge pressure for each gas to a value just below the maximum value (P_{max}).
- Always set the same outlet gauge pressure for air and nitrous oxide.
- **Never** set the outlet gauge pressure to a value exceeding the maximum pressure (P_{max}).

W5.7

Warning: Acetylene – Explosion Hazard

Acetylene can decompose explosively at pressures higher than 103 kPa/ 1.03 bar/15 psig.

- *Always make sure that the acetylene outlet gauge pressure is below this value.*

Emergency shutdown

If a situation arises where you have to shut down the system quickly and you do not have time to carry out the correct procedure, you can use the procedure described below.

Note: *This procedure is for use in an emergency only. Do not use it as a routine shutdown procedure.*

1. Switch off the spectrometer at the operational on/off switch on the front panel.
2. Shut down the gases to the spectrometer at source.

When you return to the spectrometer, proceed as follows to shut down the system properly.

3. If you were previously running concentrated salt solutions, organic solvents, or solutions containing cyanide, copper, silver, or mercury:
    1. Remove the burner head (*procedure: page 2-8*).
    2. Pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the chamber and the drain system.
4. Check the burner head.
   If there are deposits along the slot, clean the burner head (*procedure: page 3-11*).
5. Reinstall the burner head (*procedure: page 2-9*).
6. Switch on and set up the spectrometer system (*see 'Setting up the system for analyses using the flame technique', page 2-5*).
7. Ignite the flame (*procedure: page 2-21*).
8. Extinguish the flame properly (*procedure: page 3-7*).

Burner System: Maintenance Procedures

3

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PerkinElmer Service

W1.2

Warning: Unauthorized Adjustments and Servicing

Only a PerkinElmer service engineer or similarly trained and authorized person should be permitted to service the instrument.

- *Do not attempt to make adjustments, replacements, repairs, or modifications to this instrument except as described in the documentation supplied with the instrument.*

If the burner system does not function correctly...

- Switch off the spectrometer system and make sure that it cannot be operated.
- Contact your local PerkinElmer office.

You should only perform the maintenance procedures described in this guide. For any other maintenance or service contact your local PerkinElmer office to arrange for a service engineer to visit.
In particular you should only allow a PerkinElmer service engineer or similarly trained and authorized person to perform any work on:

- electrical components inside the instrument;
- the internal gas connections and gas system pneumatics.

Before the service engineer arrives:

- Make sure that the instrument and work area are clean.
- Empty corrosive solutions from the drain vessel.
  Then add water to the drain trap to activate the function.

You may perform the following burner system maintenance procedures:

- Clean the burner head.
- Disassemble the burner system for cleaning.
- Clean the nebulizer.
- Empty the drain vessel and clean the drain system.

Checklist for regular maintenance tasks

If you analyze samples that have ‘dirty’ matrices, such as blood, sugar or oil, you will probably have to clean the components more often than if you were analyzing ‘clean’ samples, such as drinking water.

Burner system, maintenance checklist	
Burner system	Always rinse the burner system correctly before extinguishing the flame (*procedure: page 3-7*). If you are analyzing *samples with high solids content*: Clean the spray chamber at least once daily (*procedure: page 3-14*). If you are using *organic solvents*: Clean the spray chamber before you switch to aqueous solutions (*procedure: page 3-14*). Empty the drain vessel and dispose of hazardous solutions properly. If you are analyzing *samples containing high concentrations of copper, silver, or mercury*: Thoroughly flush the spray chamber and drain tube immediately after completing such analyses (*procedure: page 3-15*). Empty the drain vessel and dispose of hazardous solutions properly.
Burner head	Inspect the burner head for deposits before igniting the flame. The burner should provide an even flame over the length of the burner slot. An uneven flame may indicate that the slot needs cleaning. Clean if necessary (*procedure: page 3-11*). Check the width of the burner slot periodically (*procedure: page 3-12*).
Nebulizer	If there is an obstruction in the nebulizer, clear it using a copper cleaning wire (*procedure: page 3-21*).
Drain system	Flush the drain system thoroughly at the end of each working day (*procedure: page 3-32*).
Drain vessel	Empty the drain vessel regularly (*procedure: page 3-33*). **Do not** allow it to fill with corrosive, toxic, or organic solutions. Dispose of hazardous solutions properly.
Drain trap assembly	Periodically remove the drain trap assembly from the drain vessel and clean it (*procedure: page 3-34*).

Drain tube	Inspect the drain tube regularly for wear and/or chemical attack. Replace it if it has deteriorated (*procedure: page 3-36*).
Gas hoses	Check the gas hoses regularly for leaks, particularly at the fittings, using a proprietary leak testing fluid. Call a PerkinElmer service engineer if a leak is detected.
O-rings	Check the condition of the O-rings regularly: – burner end cap O-ring or gasket (*see Figure 3-3*); – burner head O-ring (*see Figure 3-3*); – four O-rings on the nebulizer (*see Figure 3-9*).
Acetylene cylinder	If the cylinder pressure falls to below 600 kPa (6 bar; 87 psig) some of the solvent used to stabilize the acetylene (e.g. acetone) may be carried over into the burner. This could influence the characteristics of the burner. Always change to a new acetylene cylinder when the cylinder pressure falls to below this value.

Maintaining the burner system

Procedures described:

- Rinsing the burner system and extinguishing the flame (*procedure: page 3-7*).
- Disassembling the spray chamber (*procedure: page 3-8*).
- Cleaning the burner system (*procedure: page 3-11*).
- Reassembling the burner system (*procedure: page 3-16*).

Extinguishing the flame

Before you extinguish the flame or begin maintenance or disassembly procedures, you must rinse the burner system. After you extinguish the flame, allow the burner head to cool.

To rinse the system:

The procedure for rinsing the burner system depends on the type of samples that you have analyzed.

Recommendations:

- If the sample solutions contained organic solvents, use a multi-rinse procedure to remove all traces of the solvents from the system.
- If the sample solutions contained toxic substances, you must rinse all traces of these substances out of the system.
- If the sample solutions contained high concentrations of copper, silver or mercury salts, which can form unstable acetylides, you must rinse all traces of these substances out of the system.

Procedures:

- If you used only aqueous solutions during the analyses:
  1. Aspirate deionized water for 5 minutes.
- If you used organic solvents during the analyses:
  1. Aspirate for 5 minutes an organic solvent that is miscible with the samples that have just been aspirated.
  2. Aspirate for 5 minutes methanol or another solvent that is miscible both with water and the solvent used previously.
  3. Aspirate 1% (V/V) nitric acid solution for 5 minutes.
  4. Aspirate deionized water for 5 minutes.

To extinguish the flame:

1. In the **Flame Control** window, click on the **Flame** icon.
   The system uses a predetermined shutdown sequence to extinguish the flame safely.
2. Shut down the gases to the spectrometer at source.
3. In the **Flame Control** window, click on **Bleed Gases** to depressurize the gas lines.

Disassembling the spray chamber

> ***Warning: Toxic or Corrosive Residues***
> *If you had previously been aspirating toxic or corrosive samples, any residues in the spray chamber may also be toxic or corrosive.*
> - *Wear protective gloves while you are disassembling the spray chamber.*

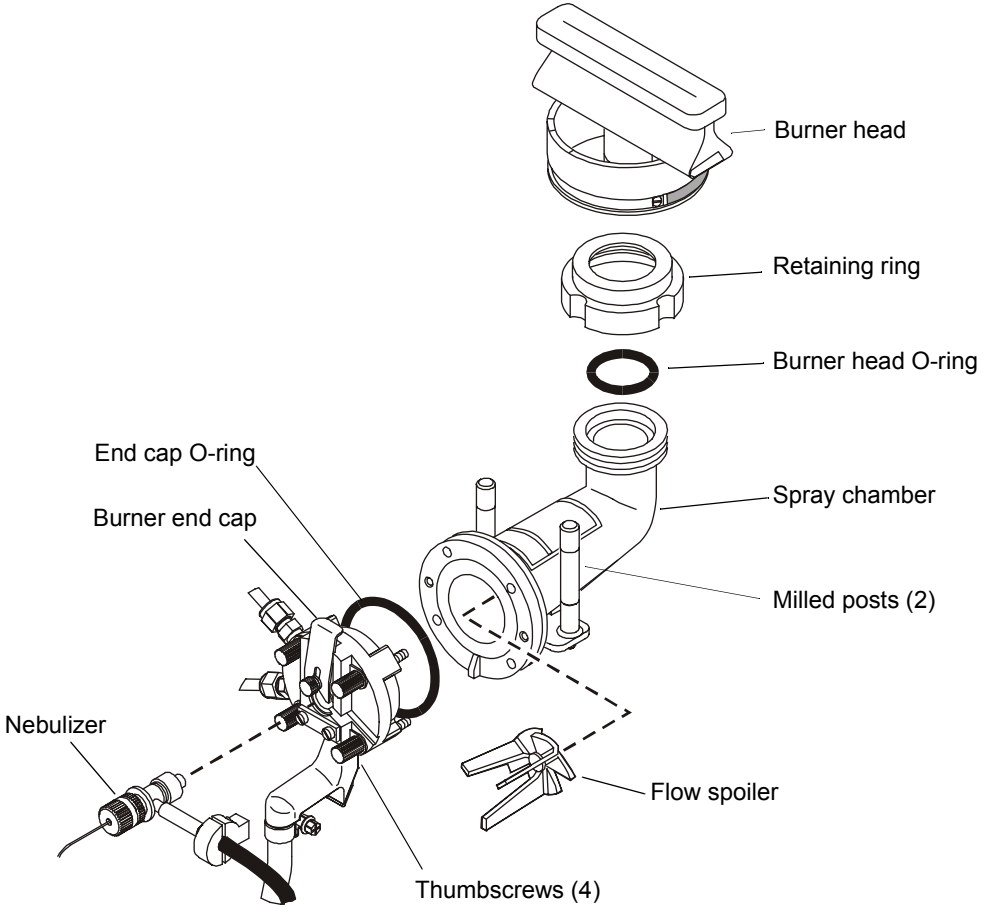


Figure 3-1. Exploded view of the burner system

Refer to Figure 3-1 and Figure 3-2 while disassembling the spray chamber.

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. If corrosive or toxic samples were run previously, pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the inside and the drain system.
5. Remove the nebulizer from the burner end cap and carefully allow it to hang down (*procedure: page 3-23, step 3*).

If it is necessary to totally remove the burner end cap for thorough cleaning, continue with step 6, otherwise go to step 7 (*see Figure 3-2*). Do not totally remove the burner end cap unless absolutely necessary.

6. Disconnect the drain interlock connector and the hoses from the end cap:
    1. Slacken the securing ring and unplug the drain interlock connector.
    2. Slacken the clamp and carefully pull the drain tube off the drain fitting.
    3. Disconnect the auxiliary oxidant hose and the fuel hose using the double-wrench technique (hold the end cap fitting with one wrench and unscrew the compression fitting with the other wrench).
7. Remove the burner end cap:
    1. Unscrew the four thumbscrews holding the end cap to the spray chamber.
    2. Carefully allow the end cap to hang down (you do not need to disconnect any of the hoses, except for thorough cleaning of the end cap).
8. Withdraw the flow spoiler from inside the spray chamber.
9. Unscrew the two milled posts securing the spray chamber to the burner carriage and remove the spray chamber.
10. Unscrew the retaining ring from the spray chamber and remove the burner head O-ring.

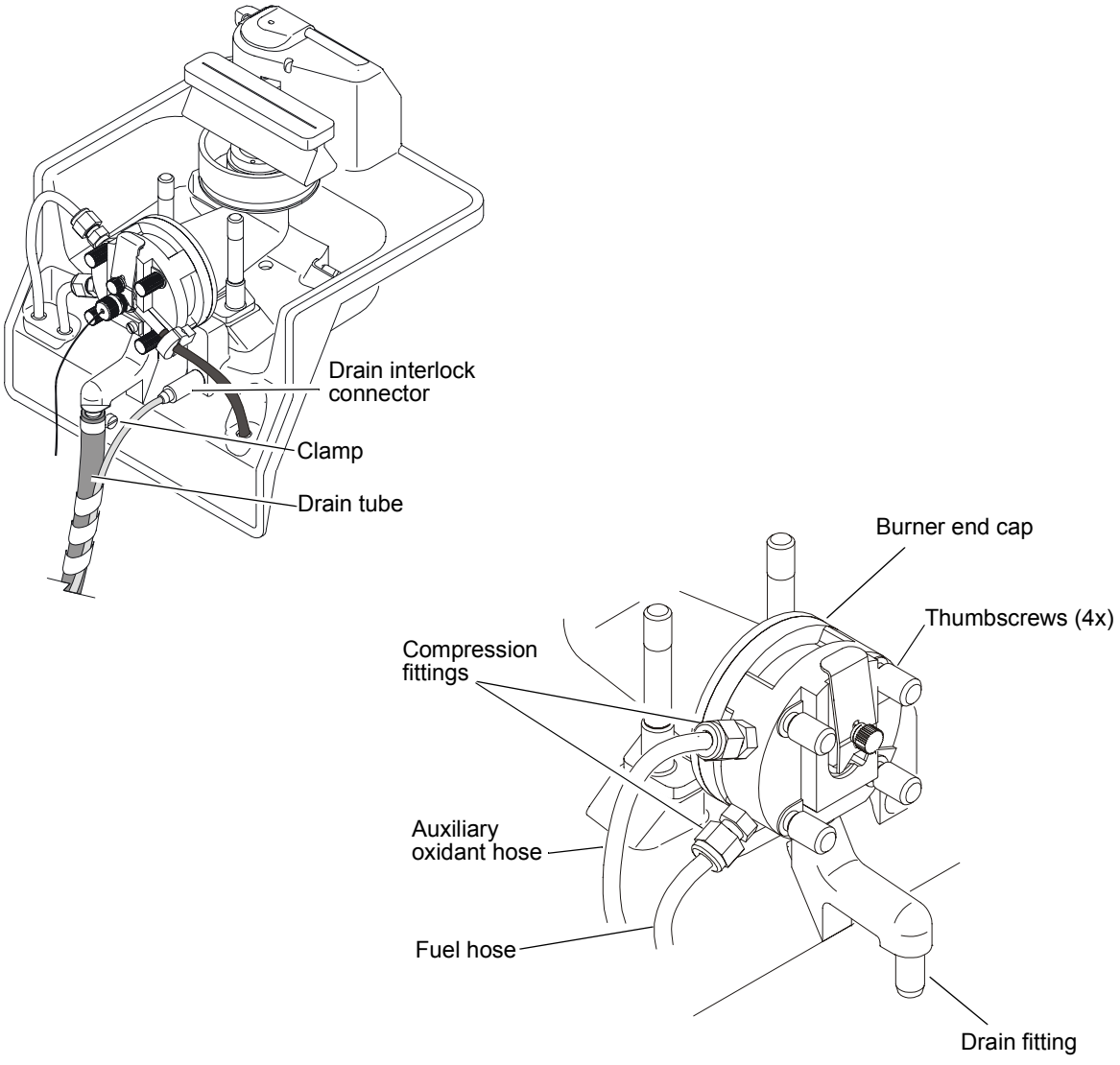


Figure 3-2. Disconnecting the burner end cap

Cleaning the burner system

The nature of the samples aspirated determines how frequently you need to clean the burner system.

- The burner should provide an even flame over the length of the burner slot. An uneven flame may indicate that the slot needs cleaning.
  A badly clogged slot may cause a flashback of the flame.
- Aspirating samples with high solids content may cause deposits to build up along the burner slot.
- Prolonged operation of the nitrous oxide-acetylene flame may cause deposits of pyrolytic carbon to build up along the burner slot.

Cleaning the burner head

Quick cleaning procedure

W4.2

Warning: High Temperatures – Risk of Burns
The burner head can reach very high temperatures.
- *Do not touch the burner head until it has cooled to room temperature.*

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. Carefully work along and through the burner head slot with the cleaning tool provided.

   Note: *Do not nick the edges of the slot.*
   The cleaning tool resembles a strip of thin metal sheet. Do not use other tools to clean inside the burner slot since they may have burrs that could nick the slot.
5. Rinse the burner head well with deionized water and make sure that all scrapings are removed from inside and outside the burner head.
6. Blow the burner head dry with clean compressed air.
   Wear safety glasses when doing this.

7. Reinstall the burner head (*procedure: page 2-9*).
8. Refit the atomizer compartment door (*procedure: page 2-4*).

Complete cleaning procedure

If the quick cleaning procedure, above, fails to remove deposits or if you wish to clean the burner head more thoroughly, continue as given below:

W8.6

Warning: Hydrochloric and Nitric Acids – Risk of Burns

Hydrochloric (HCl) *and nitric* (HNO_3) *acids are corrosive and can cause severe burns.*

- *When using acid, always wear suitable protective clothing including a face mask, work in a fume hood, and observe the manufacturer's instructions and your local safety regulations.*

1. Clean the burner head in a solution of 10% (V/V) nitric acid **or** 15% (V/V) hydrochloric acid, preferably in an ultrasonic cleaning bath. Treat the burner head for at least 10 minutes.
2. Rinse the burner head well with deionized water.
3. Blow the burner head dry with clean compressed air.
   Wear safety glasses when doing this.
4. Reinstall the burner head (*procedure: page 2-9*).
5. Refit the atomizer compartment door (*procedure: page 2-4*).

Checking the slot width

Over time, the burner slot becomes wider due to abrasion. The level of abrasion depends on the types of solutions you are aspirating. A burner slot that is too wide causes unstable flame conditions and, in the worst case, may cause a flashback of the flame. For this reason you should check the width of the burner slot at regular intervals.

You require a set of feeler gauges to check the slot width.

The table below specifies the correct slot width and the feeler gauge required for checking.

Burner Head	Slot Width	Tolerance	Feeler Gauge for check
air-acetylene 5 cm and 10 cm	0.65 mm (0.026 inch)	+0.075/–0.025 mm (+0.003/–0.001 inch)	0.7 mm (0.030 inch)
N_2O/acetylene	0.5 mm (0.020 inch)	±0.025 mm (±0.001 inch)	0.5 mm (0.020 inch)

To check the slot width:

1. Carefully slide the specified feeler gauge through the length of the burner slot. The gauge must fit tightly in the slot.
2. If the gauge is loose in the slot, the slot is too wide. Then, discard the burner head and use a new one.

Burner head surface

The condition of the top surface of the burner head influences the stability of the signals. Discard the burner head if the top surface is corroded.

Cleaning the spray chamber

1. Disassemble the spray chamber (*procedure: page 3-8*).
2. Clean the spray chamber and flow spoiler with a soft brush and a mild laboratory detergent solution.

   Note: *Do not scrape the plastic components with metal tools. Do not soak the spray chamber in acid or use abrasive cleansers. Avoid damaging the lining of the spray chamber.*
3. After cleaning, rinse thoroughly with deionized water.
4. Reassemble the burner system (*procedure: page 3-16*).

Cleaning the spray chamber after use with organic solvents

If you aspirate aqueous samples immediately after organic samples (e.g. oils or MIBK extracts), the absorption signals can be noisy and erratic.
After aspirating organic samples, perform the procedure below to prevent contamination of subsequent aqueous samples.

1. Aspirate for 5 minutes an organic solvent that is miscible with the samples that have just been aspirated.
2. Aspirate for 5 minutes methanol or another solvent that is miscible both with water and the solvent used previously.
3. Aspirate 1% (V/V) nitric acid solution for 5 minutes.
4. Aspirate deionized water for 5 minutes.
5. Extinguish the flame and allow the burner head to cool (*procedure: page 3-7*).
6. Remove the burner head (*procedure: page 2-8*).
7. Pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the chamber and the drain system.
8. Empty the drain vessel (*procedure: page 3-33*).

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*

Cleaning the spray chamber after aspirating solutions containing Cu, Ag, or Hg

If you have aspirated high concentrations of copper, silver, or mercury solutions into an acetylene flame, unstable acetylides may have formed in the spray chamber. If permitted to dry, these compounds may explode.

1. Aspirate dilute acid (1% (V/V) HCl solution) for 5 minutes.
2. Extinguish the flame and allow the burner head to cool (*procedure: page 3-7*).
3. Remove the burner head (*procedure: page 2-8*).
4. Pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the chamber and the drain system.
5. Empty the drain vessel (*procedure: page 3-33*).

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*

Cleaning the inside of the burner end cap

Sample residues may collect in the hole for the impact bead in the end cap. Periodically you should clean out sample residues. Also, if the impact bead is broken, part of the stem may remain in the hole. You must remove the retaining plate in order to remove any broken portion.

1. Remove the two screws securing the retaining plate.
2. From the inside of the end cap, use a small probe to clean or push broken fragments to the outside of the end cap.
3. Check the condition of the O-rings and replace any that are damaged.
4. Refit the retaining plate and screws.

Reassembling the burner system

After you have completed maintenance procedures, reassemble the burner system as given below.

To reassemble the spray chamber:

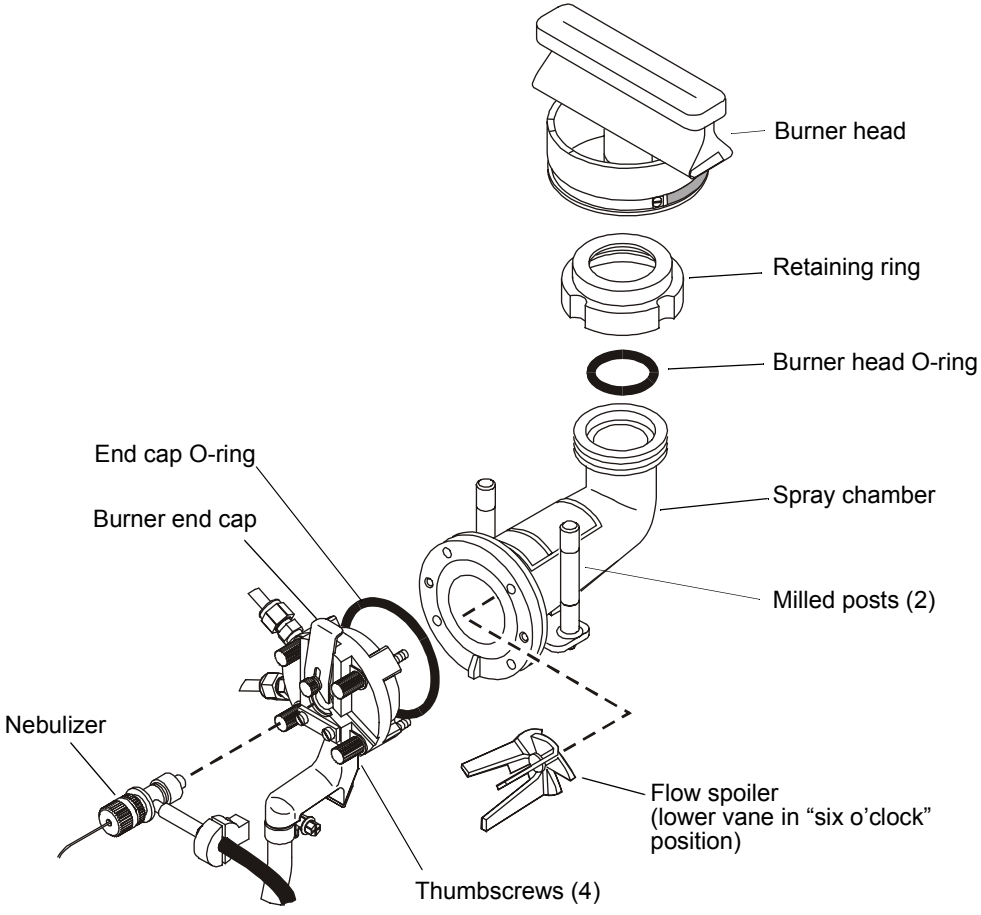


Figure 3-3. Exploded view of the burner system

1. Place the spray chamber back onto the burner carriage.
2. Locate the two milled posts into the threaded holes in the carriage and then tighten the two milled posts firmly to secure the spray chamber.

3. Slide the cleaned flow spoiler fully back into the spray chamber such that one of the vanes is in the “six o’clock” position (*see page 2-15*).
   Press the center of the flow spoiler with your index finger and push it in until it is firmly seated.
4. Check that the burner end cap O-ring (or gasket) is properly seated in the groove inside the end cap and is in good condition. If it is not, replace it (*see ‘Burner System: Parts and Supplies’* for the part number).
5. Place the end cap against the spray chamber and tighten the four thumbscrews.
   Tighten them until they are finger-tight in the sequence:
   top right, bottom left, bottom right, top left.
6. If you removed the auxiliary oxidant and fuel hoses, reconnect them:
   Tighten the compression fittings hand-tight plus a ¼ turn using the double-wrench technique (hold the end cap fitting with one wrench and tighten the compression fitting with the other wrench).

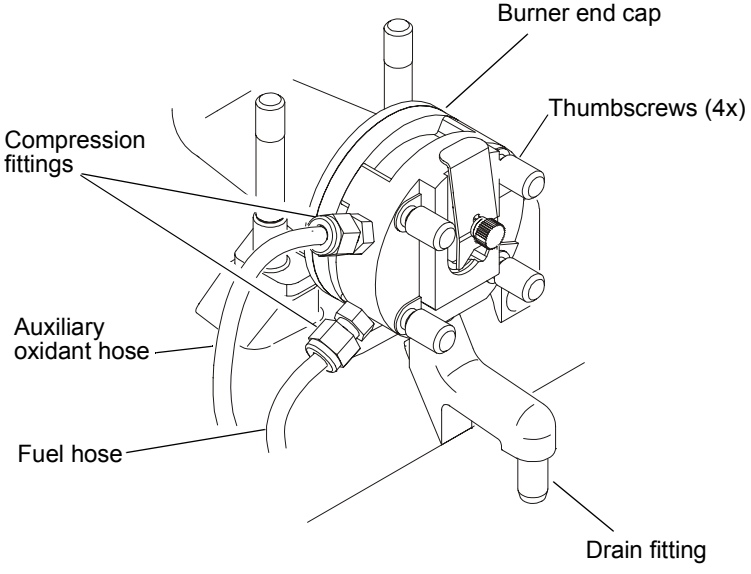


Figure 3-4. Connecting the hoses to the burner end cap

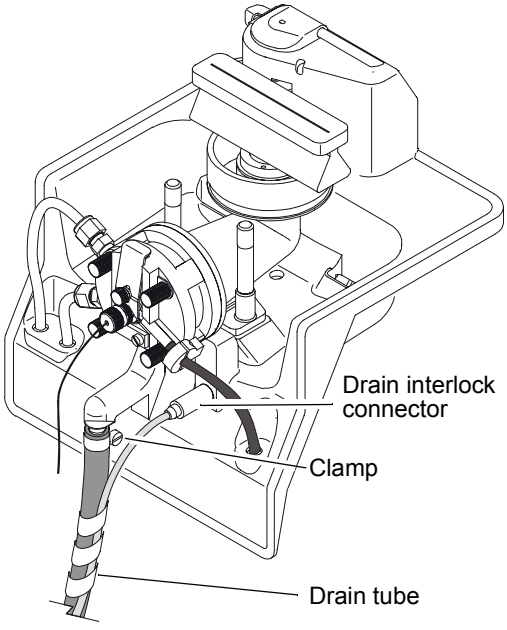


Figure 3-5. Connecting the drain tube

> ***Warning: Flammable Gases – Fire and Explosion Hazard***
> *The inner lining of the drain tube is resistant to organic solvents. If this lining is damaged, solvents can attack the drain tube. This may result in the seepage of gas which is a serious fire hazard.*
> - *Take care not to damage the lining when you remove and refit the drain tube.*

7. If you removed it, carefully push the drain tube onto the drain fitting and tighten the clamp.
8. Plug in the drain interlock connector and secure it with the securing ring.
9. Check that the burner head O-ring is properly seated in the neck of the spray chamber and is in good condition.
   If it is not, replace it (*see 'Burner System: Parts and Supplies'* for the part number).
   Apply a very small amount of Apiezon grease to the inner surface of the O-ring in order to form a good seal with the burner head. Do not let any of the grease get inside the chamber. If you do, wipe the chamber surfaces clean with a dry cloth.

10. Place the retaining ring back on the neck of the spray chamber and hand tighten.
11. Reinstall the burner head (*procedure: page 2-9*) and the nebulizer (*procedure: page 3-28*).

Maintaining the nebulizer

To maintain optimum nebulizer performance you must periodically clean the capillary assembly, and occasionally replace the sample tube.

When you aspirate concentrated samples with complex matrices, it is especially important to keep the spray chamber and nebulizer free of deposits. It is beneficial to periodically aspirate a dilute surfactant solution, such as 0.1% Triton X100, for several minutes to keep the system clean. The surfactant will encourage constant drainage, which is essential for optimum burner system performance.

Before you clean the nebulizer, because you suspect that the nebulizer is causing low absorbance readings or poor sensitivity (e.g. cannot obtain expected characteristic concentration), check that:

- The sample tube is in good condition (i.e. no kinks), is not too long, and is clean.
  With a longer sample tube, the rate of sample uptake, and thus the sensitivity, will decrease. Recommended length: 20 cm.
- The burner head is clean.
- The burner is correctly optimized; see the *Online Help* in AA WinLab.

Clearing an obstruction in the nebulizer

If you suspect that there is an obstruction in the nebulizer, try to clear it as follows:

Quick procedure:

1. With the flame burning, aspirate pure solvent until a subsequent characteristic concentration measurement gives the expected result.

If this fails to remedy the problem, go on to the procedure below.

Full procedure:

Caution: Risk of damage to the corrosion-resistant plastic nebulizer

The sample tube on the plastic nebulizer (0303-0404) is an integral part of the nebulizer capillary assembly.

- *Do not remove the sample tube from the plastic nebulizer.*

---

1. Remove the nebulizer from the burner end cap (*procedure: page 3-23*).
2. Remove the sample tube from the end of the nebulizer capillary.
3. Take one of the copper cleaning wires, provided with the nebulizer, and very carefully push it through the nebulizer capillary from the inlet side.
   Move the wire carefully in and out to dislodge any particles.

   Note: *Use only the copper cleaning wires provided (0303-0135).*
   Other wires may be burred and damage the nebulizer.
   Use a straight section of the cleaning wire to avoid scratching the interior of the capillary assembly.

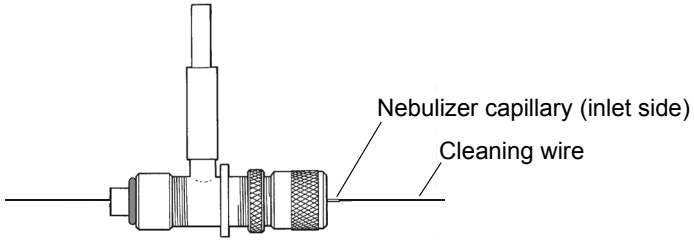


Figure 3-6. Cleaning the nebulizer with a cleaning wire

4. Reattach the nebulizer sample tube to the nebulizer capillary (*procedure: page 3-26*).
5. Reinstall the nebulizer (*procedure: page 3-28*).

6. Relight the flame and then aspirate pure solvent to rinse the nebulizer.
7. Run several calibration solutions to check that characteristic concentration measurements give the expected results.

The above cleaning procedures are usually sufficient to restore the nebulizer to satisfactory working order.
If neither of these procedures cures the problem, you must disassemble and clean the nebulizer.

Removing the nebulizer

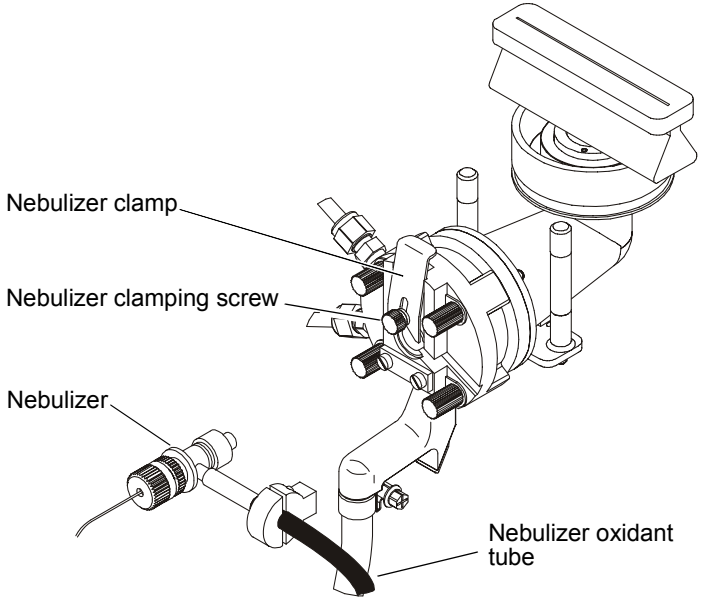


Figure 3-7. Removing the nebulizer

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the nebulizer from the burner end cap:
   1. Slacken the nebulizer clamping screw.
   2. Lift up and hold the nebulizer clamp.
      Very gently rock the nebulizer a few times to make sure that it is not sticking in the end cap.
   3. Carefully pull the nebulizer out of the end cap.
   4. Make sure that you remove the venturi O-ring with the nebulizer.
      If the O-ring remains lodged in the burner end cap, use a plastic or wooden probe to dislodge it.

4. Using a 2 mm Allen wrench, undo the two screws that retain the black magnet assembly on the nebulizer side arm.
   Take care not to lose the screws.
5. Pull the nebulizer oxidant tube from the side arm with a rocking motion.

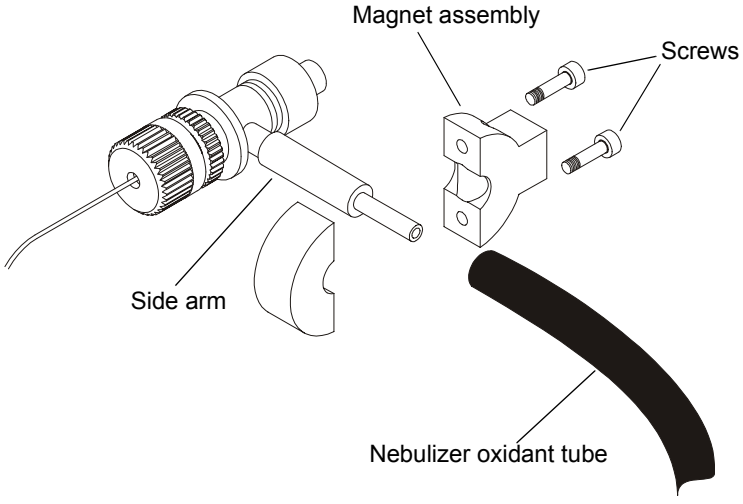


Figure 3-8. Removing the nebulizer oxidant tube

Disassembling the nebulizer

Note: *Do not disassemble the nebulizer unless you are sure that the cleaning procedures described above did not restore the nebulizer performance. The performance characteristics of the nebulizer can be modified by disassembly.*

Refer to Figure 3-9 when disassembling the nebulizer.

1. Remove the nebulizer from the burner end cap (*procedure: page 3-23*).
2. Unscrew and remove the regulator (termed ‘adjustment nut’ or ‘knurled knob’ in some documents that accompany the nebulizer).
3. Remove the capillary assembly from the nebulizer body by carefully pulling it out of the body.
4. Remove the sample tube and the PTFE disk from the capillary assembly.

   Note: ***Do not*** *remove the sample tube from the corrosion-resistant plastic nebulizer – it is an integral part of the capillary assembly.*

5. Remove the venturi O-ring from in front of the end cap.
6. Unscrew and remove the front end cap and pull out the venturi.
7. Remove the nebulizer insert by pushing it out with a wooden probe.

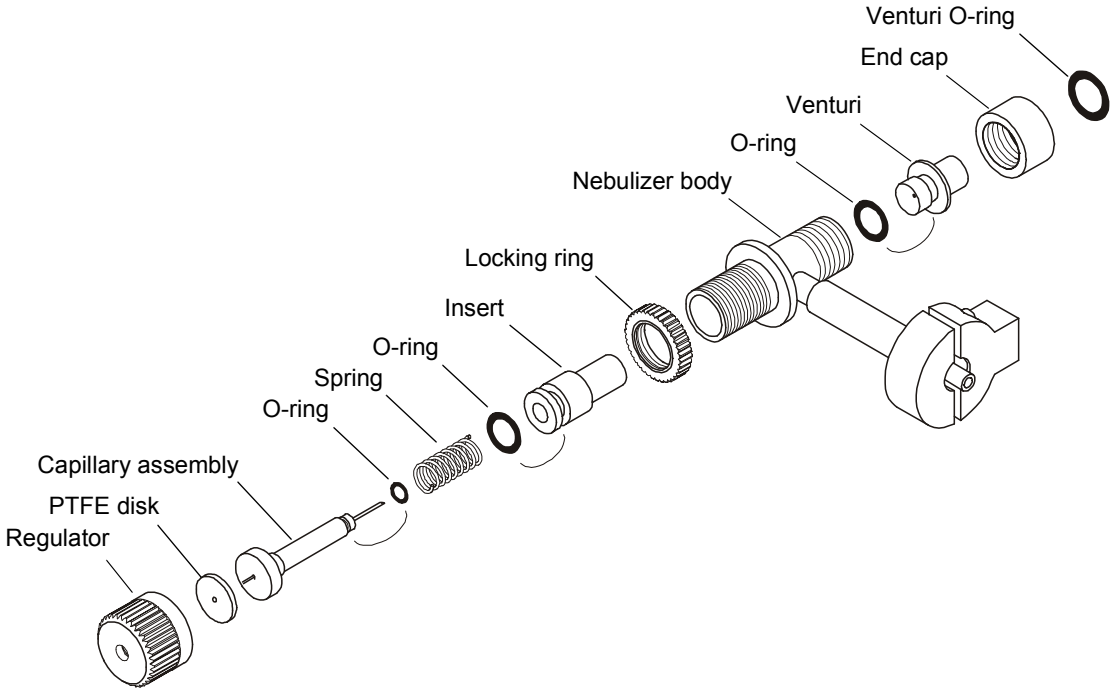


Figure 3-9. Standard nebulizer assemblies

Cleaning the nebulizer

After you have disassembled the nebulizer, clean the components as follows:

1. Clean the capillary assembly using a mild laboratory detergent solution, or a solvent such as isopropanol, preferably in an ultrasonic bath.
2. Clean the nebulizer body and any other parts that appear dirty in a mild laboratory detergent solution, or a solvent such as isopropanol, preferably in an ultrasonic bath.
3. Rinse all the cleaned components thoroughly with deionized water.
4. Inspect the O-rings (1 on the capillary assembly, 1 on the insert, 1 on the venturi, and the one that fits over the venturi in front of the end cap) and clean them if necessary in mild laboratory detergent solution, followed by a thorough rinsing with deionized water.
   If they look damaged, replace them (*see 'Nebulizer components', page 4-7*).

After you have cleaned the components, reassemble the nebulizer.

Reassembling the nebulizer

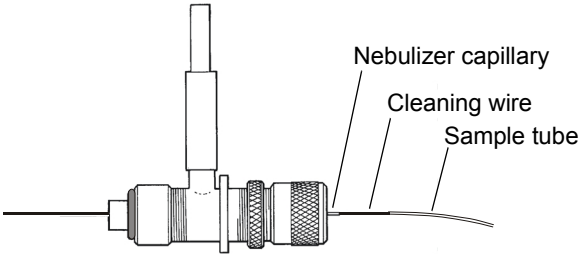
Refer to Figure 3-9 when reassembling the nebulizer.

1. Lightly lubricate the surface of the O-ring on the insert with a **minimum** of Apiezon grease (supplied with the nebulizer).
2. If not already done, inspect the tiny O-ring on the capillary assembly for damage and replace it if necessary.
   Lightly lubricate the surface of the O-ring with a **minimum** of Apiezon grease. Make sure that no grease gets onto the tip of the capillary.
3. Slide the spring back onto the capillary assembly (if it was removed).
4. Push the capillary assembly into the insert. Check that the capillary tip protrudes through the small aperture in the insert when you press in the capillary assembly.
5. Insert these assembled components into the nebulizer body.
   Orientate the capillary assembly so that the bevelled edge of the capillary faces the nebulizer side arm; this position generally provides best solution aspiration.
6. Slide the PTFE disk onto the capillary assembly and then screw on the regulator.

7. Carefully push the venturi into the front end of the nebulizer body and screw on the end cap.
8. Slip the O-ring over the protruding end of the venturi.
9. Attach the sample tube to the nebulizer capillary:
    1. Use the old, cleaned, sample tube, or cut a 20 cm length from the 0.6 mm i.d. tube provided with the nebulizer.
    Cut the tube with a scalpel – do not use scissors.
    2. Take one of the copper cleaning wires, provided with the nebulizer, and very carefully push it through the nebulizer capillary from the inlet side.

    Note: *Use only the copper cleaning wires provided (0303-0135).*
    Other wires may be burred and damage the nebulizer.
    Use a straight section of the cleaning wire to avoid scratching the interior of the capillary assembly.

    3. Using the wire as a guide, push the sample tube onto the capillary.
    4. Remove the cleaning wire.



Installing the nebulizer

W5.10

Warning: Flammable Gases – Fire and Explosion Hazard

The use of the wrong type of nebulizer for your burner system may result in a seepage of fuel gas which is a serious fire hazard.

- *Use only the nebulizers specified for the burner system.*

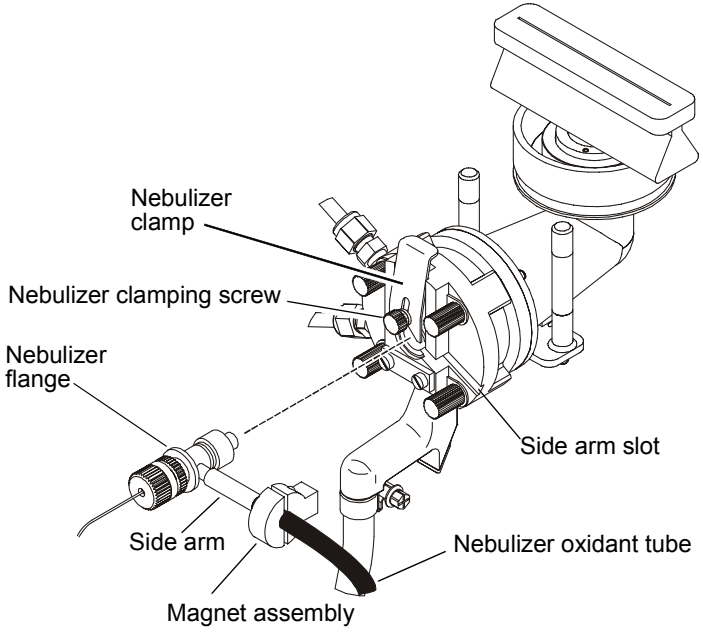


Figure 3-10. Installing the nebulizer

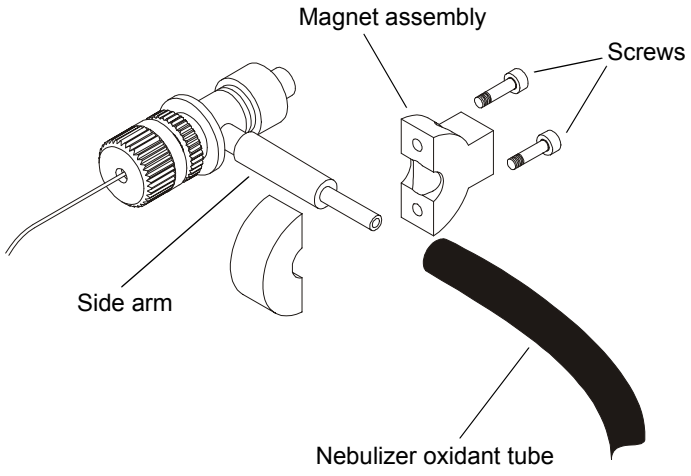
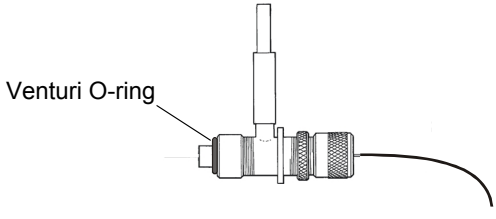


Figure 3-11. Connecting the nebulizer oxidant tube

1. Connect the nebulizer oxidant tubing:
   1. Push the nebulizer oxidant tube onto the nebulizer side arm.
   2. Replace the black magnet assembly on the side arm and tighten the two securing screws (refer to Figure 3-11).
      The magnet assembly serves to clamp the oxidant tube on the side arm and also contains the magnet that activates the nebulizer interlock.
2. Before you install the nebulizer, verify that the O-ring on the venturi is properly located and in good condition. If it appears damaged, replace it. Never install a nebulizer without a correctly installed O-ring.



3. Install the nebulizer in the burner end cap:
   1. Lift up and hold the nebulizer clamp.
   2. Holding the nebulizer with the side arm to the right, insert the nebulizer into the port in the end cap.
   3. Push the nebulizer into the end cap as far as it will go. The nebulizer side arm must be located in the slot in the end cap.

4. Lower the nebulizer clamp, making sure that it locks **over** the nebulizer flange, and then tighten the nebulizer clamping screw.
5. Pull on the nebulizer gently to make sure that the nebulizer clamp is properly engaged.
6. Make sure that the magnet assembly fits snugly alongside the burner end cap and that the magnet is facing the nebulizer interlock sensor (*see Figure 3-13*).

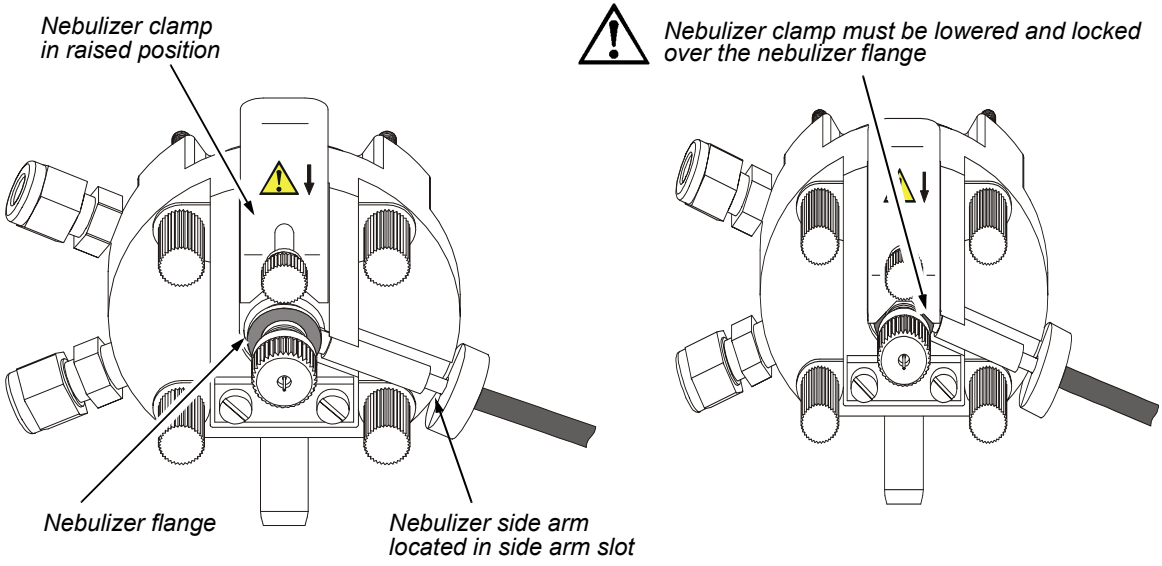


Figure 3-12. Securing the nebulizer

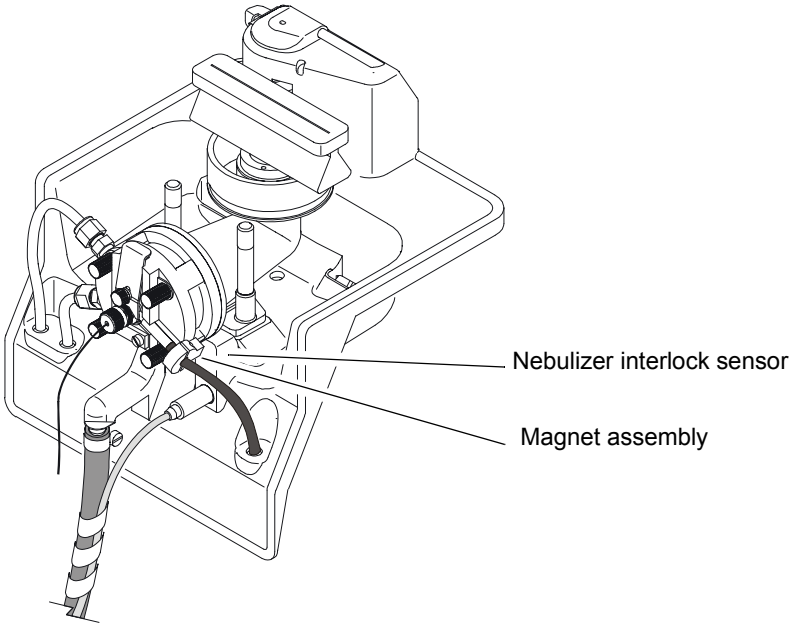


Figure 3-13. Aligning the magnet assembly

This completes installation of the nebulizer. You should now set up the nebulizer, then optimize the burner and nebulizer before checking the sensitivity. Refer to the *Online Help* in AA WinLab.

Maintaining the drain system

Always place the drain vessel in a well ventilated place underneath the spectrometer, **in full view** while you are working with the spectrometer. This prevents the build-up of potentially hazardous gases, and allows you to see the liquid level.

Maintenance procedures that you can perform yourself are described below. The drain trap and switch assembly should be replaced by trained service personnel only.

You must check the drain tube and vessel periodically for wear and/or chemical attack. The drain tube should be clear with as few bends as possible. You should replace the drain tube if it has deteriorated.

Flushing the drain system

At the end of each working day, flush the drain system thoroughly with water to remove caustic, corrosive, or organic waste materials that could otherwise damage the spray chamber or drain tube.

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. Pour a large quantity of deionized water slowly through the neck of the spray chamber to thoroughly flush the inside and the drain system.
5. Empty the drain vessel (*procedure: page 3-33*).

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*

Emptying the drain vessel

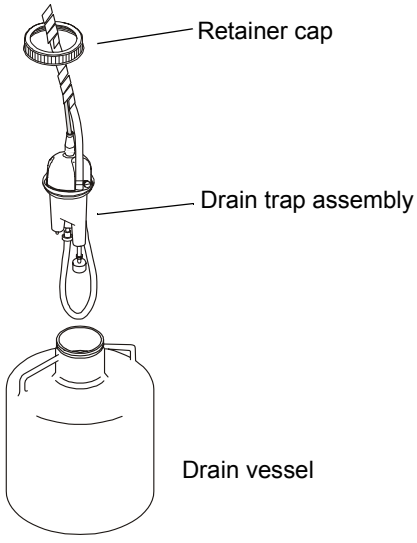


Figure 3-14. Drain vessel and drain trap assembly

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Switch off the spectrometer.
3. Flush the drain system (*procedure: page 3-32*).
4. Unscrew the retainer cap from the drain vessel.
5. Carefully lift out the drain trap assembly.
   Do not disconnect the electrical lead.
6. Place the drain trap assembly into a suitably large bucket or container so that it is vertical.
   If the drain trap assembly is laid on its side, liquid can run out onto the floor.
7. Rinse the outside of the assembly well with water.
8. Empty the drain vessel.

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*
9. Place the drain trap assembly back into the drain vessel and screw on the retainer cap.

Adding water to the drain trap

The drain vessel includes an internal trap to make certain that burner gases cannot escape into the drain vessel (*more information: page 5-9*). Enough water must be present in the drain system to fill the drain loop and to activate the drain float. If not, carry out the following procedure:

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Remove the atomizer compartment door (*procedure: page 2-4*).
3. Remove the burner head (*procedure: page 2-8*).
4. Pour about 250 mL deionized water slowly through the neck of the spray chamber to fill the drain trap and activate the drain float.
5. Reinstall the burner head (*procedure: page 2-9*).
6. Refit the atomizer compartment door (*procedure: page 2-4*).

Cleaning the drain trap assembly

The drain trap assembly is located inside the drain vessel. Periodically you should remove the assembly and clean it.

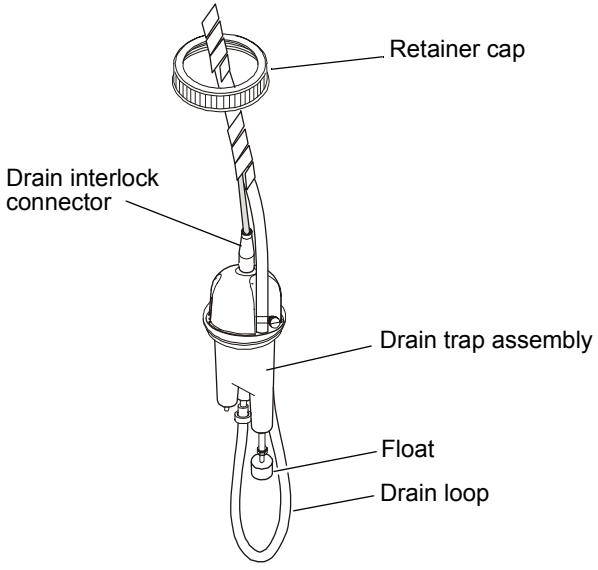


Figure 3-15. Drain trap assembly

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Switch off the spectrometer.
3. Flush the drain system (*procedure: page 3-32*).
4. Unscrew the retainer cap from the drain vessel.
5. Carefully lift out the drain trap assembly.
   Do not disconnect the electrical lead.
6. Place the drain trap assembly into a suitably large bucket or container so that it is vertical.
   If the drain tap assembly is laid on its side, liquid can run out onto the floor.
7. Clean the drain trap assembly carefully with mild laboratory detergent solution using a test tube brush.
   Make sure that the float moves freely.
8. Rinse the assembly well with water.
9. Empty the drain vessel (*procedure: page 3-33*).

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*
10. Place the drain trap assembly back into the drain vessel and screw on the retainer cap.

Replacing the drain tube

If the drain tube is damaged or extremely dirty you should replace it. It is very important that the inner lining of the drain tube is not damaged.
The replacement procedure is described below:

1. Extinguish the flame, allow the burner head to cool, shut down the gases at source, and bleed the gas supply lines (*procedure: page 3-7*).
2. Switch off the spectrometer.
3. Empty the drain vessel (*procedure: page 3-33*).

   Note: *Dispose of hazardous or corrosive solutions properly and refer to your local safety regulations for proper disposal procedures.*

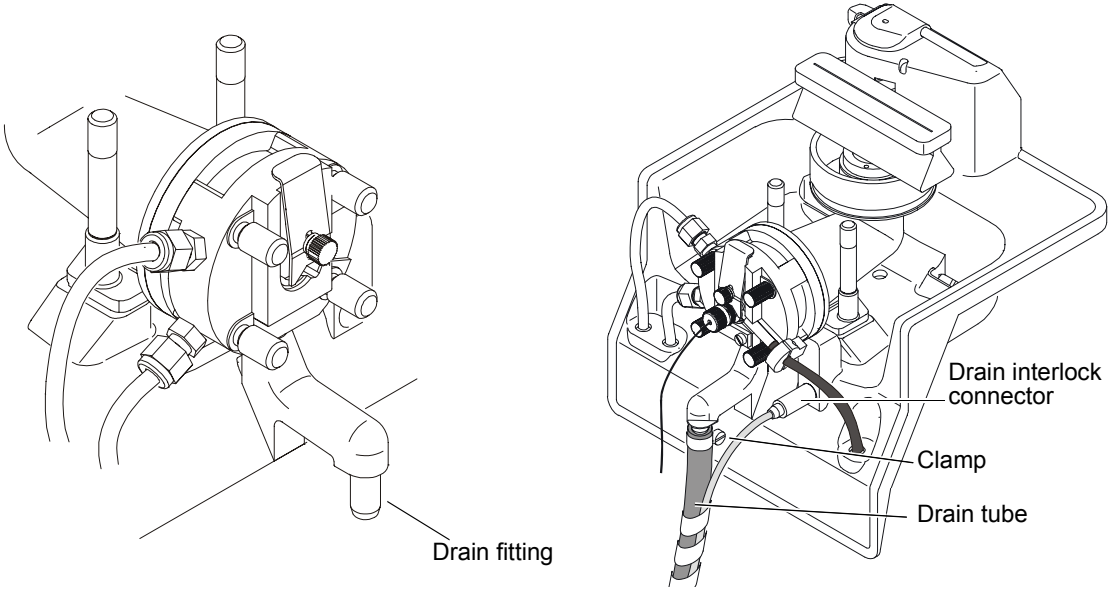


Figure 3-16. Replacing the drain tube

4. Slacken the securing rings on the drain interlock connectors at both the burner unit and the drain trap assembly. Unplug both connectors.
5. Disconnect the drain tube from both the drain trap assembly and the drain outlet on the burner end cap by loosening the clamps on each end of the tube. Once the clamps are loosened, the tube should easily pull out.
6. Remove the spiral wrap from the drain tube by unwrapping it. This will release the drain interlock cable.

Warning: Flammable Gases – Fire and Explosion Hazard

The inner lining of the drain tube is resistant to organic solvents. If this lining is damaged, solvents can attack the drain tube. This may result in the seepage of gas which is a serious fire hazard.

- *Take care not to damage the lining when you remove and refit the drain tube.*

7. Place the new piece of drain tube next to the drain interlock cable and carefully rewrap the spiral wrap around both of them.
8. Place the drain clamp on the upper end of the new drain tube.
   Then attach the tube to the drain fitting on the burner end cap. Tighten the clamp securely.
9. Place the other drain clamp on the lower end of the drain tube.
   Then attach the tubing to the drain trap assembly. Tighten the clamp securely.
10. Plug in both drain interlock connectors and secure them with the securing rings.
11. Precondition the new drain tube (see next section).

Preconditioning a new burner or drain tube

In order for a new sample introduction system to aspirate and drain smoothly, the internal surfaces must be preconditioned.

Note: *You must perform this procedure directly after installation of a new burner system and you should repeat it if you replace the drain tube or any of the sample introduction components.*

1. Aspirate for 5 minutes a 1+1 solution of methanol in water.

Maintaining the acetylene supply

W5.7

Warning: Acetylene – Explosion Hazard

Acetylene can decompose explosively at pressures higher than 103 kPa / 1.03 bar / 15 psig.

- *Always make sure that the acetylene outlet gauge pressure is below this value.*

- You should depressurize both the fuel and oxidant gas hoses at the end of the working day or if you are not going to use the instrument for an extended period. Close the cylinder valves to avoid the possibility of gas hoses being subjected to the full cylinder pressure in the event that a pressure regulator should fail.
- Acetylene is supplied dissolved in a solvent such as acetone, and a small amount of solvent carryover with the acetylene is normal. However, as tank pressure falls, the relative amount of solvent entering the gas stream increases and can give erratic results, particularly for elements such as calcium, tin, chromium, molybdenum and others whose sensitivity is highly dependent on the fuel:oxidant ratio.The pressure drop is not linear with gas removal since the acetylene is dissolved in a solvent, and a pressure of 600 kPa (6 bar; 85 psig) at ambient temperature indicates that the cylinder is nearly empty. For this reason, replace acetylene cylinders when the cylinder pressure drops to about 600 kPa (6 bar; 85 psig).
- Always store and use acetylene cylinders vertically, rather than horizontally, to prevent liquid acetone from reaching the cylinder valve.
- The practice of ‘cracking the valve’ of an acetylene tank (that is, opening the valve slightly for a very short period previous to attaching the regulator) is not recommended. While such an action will clear the valve opening of dust or dirt particles and may remove acetone from the cylinder valve, it is a potentially hazardous practice and one which should never be attempted in the presence of an open flame, sparks or other possible sources of ignition.

Burner System: Parts and Supplies

4

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Obtaining supplies, replacement parts, and accessories

Supplies, replacement parts, and accessories can be ordered directly from PerkinElmer, using the part numbers quoted in this guide. PerkinElmer's catalog service offers a full selection of high-quality atomic spectroscopy supplies through the *Atomic Spectroscopy Supplies Catalog*.

To place an order for supplies and many replacement parts, request a free catalog, or ask for information:

- If you are located *within the U.S.*, call toll free **1-800-762-4002**, 8 a.m. to 8 p.m. EST. Your order will be shipped promptly, usually within 24 hours.
- If you are located *outside of the U.S.*, call your local PerkinElmer sales or service office.

What is listed in this chapter

This chapter lists the most important replacement parts for your burner system. Information about other parts and accessories is given in the current PerkinElmer brochures and price lists.

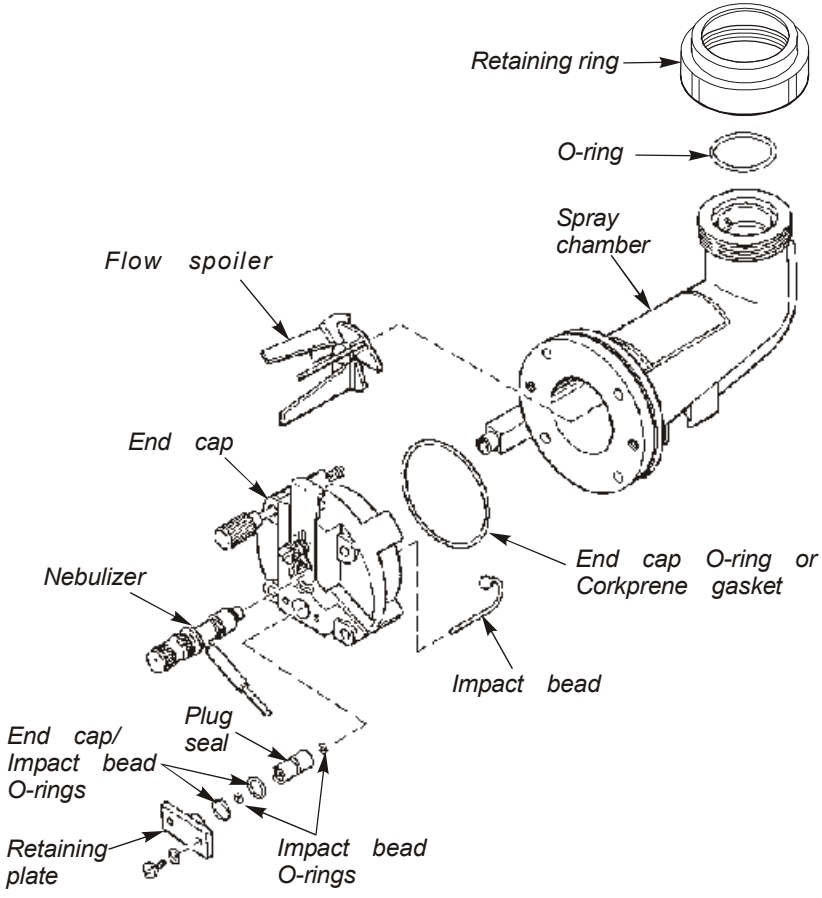

Figure 4-1. Burner components

Description	Part No.
Burner components	
Spray chamber	0057-0948
Burner end cap	0057-0984
Flow spoiler	0057-2561
Impact bead	0057-2615
Burner head cleaning tool	0303-1573
Kalrez O-ring for end cap	0992-1044
Burner gasket kit (0047-0988)	
Includes the following gaskets:	
3 Viton O-rings for end cap (general use)	0990-2147
5 Corkpreen gaskets for end cap (use with organics)	0047-2014
3 O-rings for the neck of the spray chamber (for the burner head)	0990-2219
3 impact bead O-rings	0990-2236
3 O-rings for end cap retaining plate	0990-2240
Burner heads	
5 cm, single-slot burner head for nitrous oxide-acetylene operation	N040-0100
5 cm, single-slot burner head for air-acetylene operation	N040-0101
10 cm, single-slot burner head for air-acetylene operation	N040-0102
10 cm, three-slot burner head for air-acetylene operation	N040-0103
Drain system	
Drain tube	0250-7987

Description	Part No.
Nebulizers	
Standard stainless steel nebulizer kit	0303-0352
Platinum alloy nebulizer kit includes a platinum alloy capillary assembly and tantalum venturi	0303-0299
Corrosion-resistant plastic nebulizer kit	0303-0404
Nebulizer supplies	
O-ring kit, includes all O-rings used with the nebulizer and the PTFE disk	N930-0065
Sample tube (nebulizer capillary tubing), 3 m	0990-8265
Apiezon grease, 1 tube	0303-0405
Cleaning wires, pack of 5	0303-0135

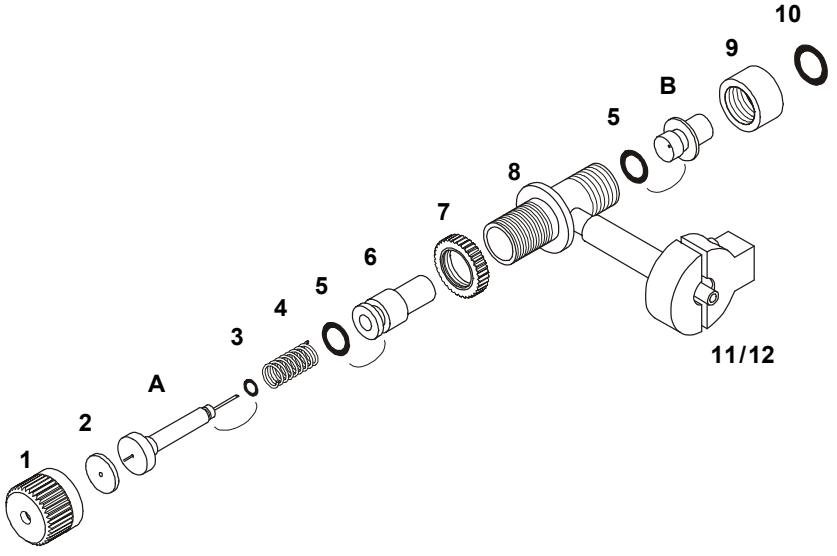

Figure 4-2. Components of the nebulizer

Nebulizer components

Item	Description	Part No.
A	Capillary assemblies:	
	Stainless steel capillary assembly	0303-0354
	Platinum alloy capillary assembly	0303-0433
	Plastic capillary assembly with integral sample tube	0303-0402
	Plastic capillary assembly with long integral sample tube for use with an autosampler	0057-0957
B	Venturi:	
	Stainless steel	0303-1810
	Platinum alloy	0303-3124
	Plastic	0303-1920
1	Regulator	0303-1460
2	PTFE disk	0303-1802
3	O-ring on capillary assembly	0990-2102
4	Spring	0303-1806
5	O-ring	0990-2005
6	Insert	0303-1812
7	Locking ring	0303-1456
8	Nebulizer body	0303-0353
9	End cap	0303-1808
10	O-ring	0990-2239
11	Magnet/tube clamp assembly	N040-1159
12	Bar magnet	0992-3133

Burner System Description 5

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Burner system design

The burner system used in the spectrometer system is of the premix design. The measurement solution is sprayed by a pneumatic nebulizer into the spray chamber in the form of an aerosol. This aerosol is thoroughly premixed with the burner fuel and oxidant gases in the spray chamber. This gas mixture then passes through the burner slot into the flame.

The burner system is mounted on a carriage that can be driven into and out of the atomizer compartment by software command. In this way you can change between flame atomization and electrothermal atomization easily within a few seconds.

The burner system comprises the following major components (see the illustration below):

- Nebulizer
- Spray chamber with burner end cap, flow spoiler, and impact bead
- Burner head
- Drain system (not shown)
- Gas control system (incorporated in the spectrometer)

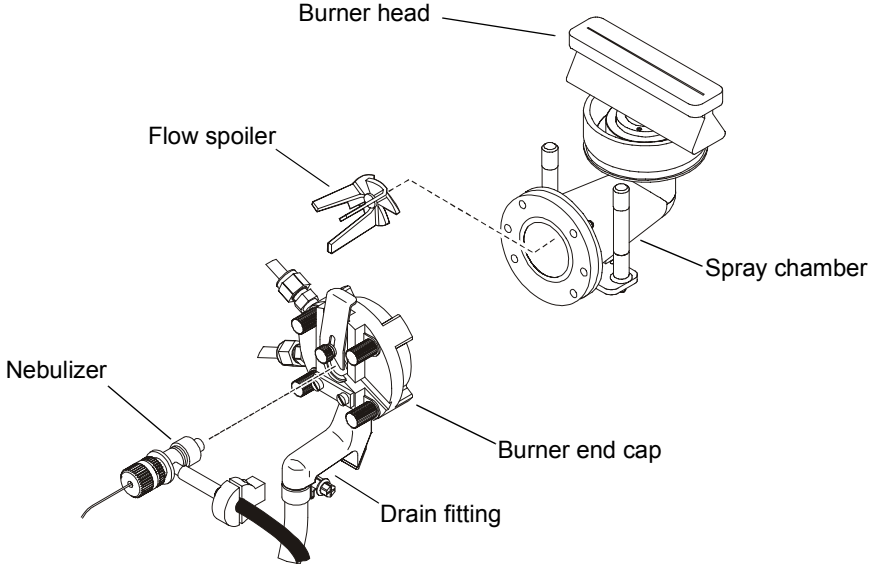

Figure 5-1. Major components of the burner

How the burner system works

The burner is a ‘dual option system’ which means that it can be used with or without a flow spoiler. The burner system is designed for the use of both the air-acetylene flame and the nitrous oxide-acetylene flame. Interchangeable burner heads are provided for each type of flame; the nitrous oxide burner head has a narrower slot than the air-acetylene burner head.

A block diagram of the system is depicted in Figure 5-2.

The measurement solution (a blank, sample, or calibration solution) is aspirated by a pneumatic nebulizer and sprayed as a fine aerosol into the spray chamber. In the spray chamber the aerosol is thoroughly mixed with the burner fuel and oxidant gases. The fuel gas is acetylene while the oxidant is either air or nitrous oxide. The fuel gas enters the spray chamber via the fuel inlet hose. A portion of the total oxidant flow is used to nebulize the sample into the spray chamber, while the other portion enters the chamber via the auxiliary oxidant hose.

An impact device (flow spoiler or impact bead) is inserted into the spray chamber. The larger aerosol droplets that are not carried by the gas flow around the flow spoiler condense out at the bottom of the spray chamber and run to waste through the drain. It is important to prevent large droplets from reaching the flame since they can pass through the flame without being completely decomposed; this can lead to solute-volatilization and vapor-phase interferences. If required, an impact bead can be positioned in front of the nebulizer venturi. The impact bead leads to an improvement in the sensitivity for elements that are determined in the air-acetylene flame when the sample matrix is fairly simple. The impact bead is not suitable for use with the nitrous oxide-acetylene flame or when the sample matrix contains a relatively high salt content.

In the flame the aerosol is desolvated, the resulting solid particles are decomposed, and the analyte is atomized.

The gas control system monitors and regulates the fuel and oxidant flows to the burner. Operation of the burner, including flame ignition, flame shutoff and gas flow rate settings, is controlled via the computer and the AA WinLab software.

The system incorporates safety interlock sensors to ensure safe operation of the flame.

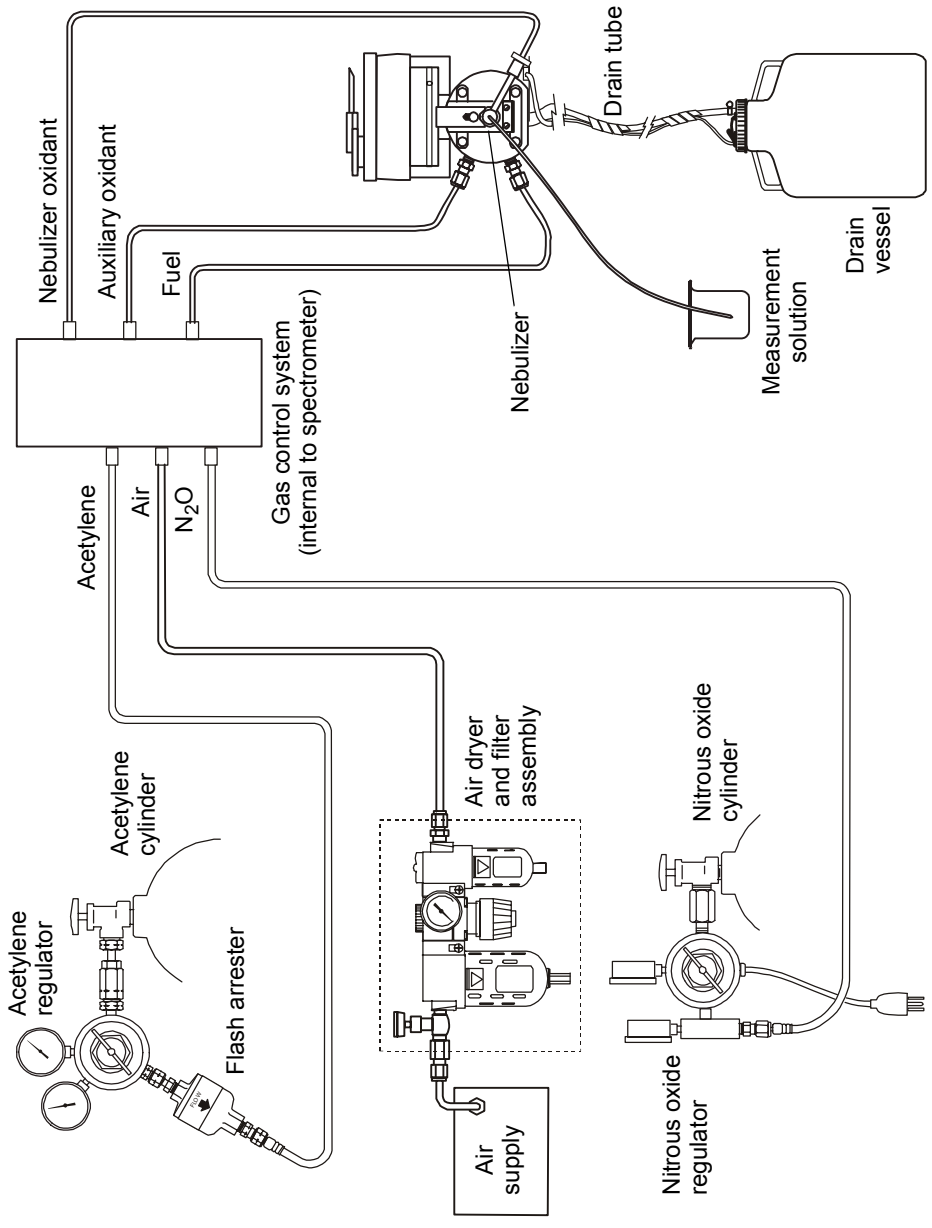

Figure 5-2. Block diagram of the complete burner system

Burner components

The spray chamber and end cap

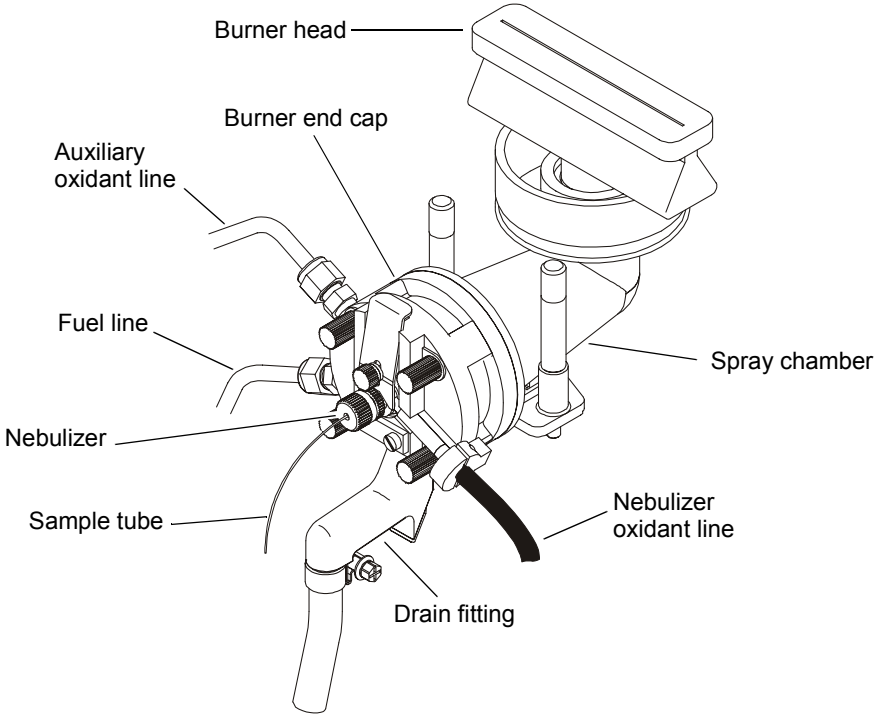

Figure 5-3. Details of the burner system

The burner system uses a chemical-resistant, high-strength plastic spray chamber. The spray chamber is angled to ensure proper drainage.

The fuel gas, auxiliary oxidant, and drain fittings are located on the end cap.

An impact device (flow spoiler or impact bead) allows only the finer aerosol droplets to pass through the chamber to the burner head. The larger droplets condense out and are removed via the drain.

The sample aerosol is thoroughly mixed with the fuel and oxidant gases in the spray chamber. A separate auxiliary oxidant line allows variation of the fuel-to-oxidant ratio without varying the nebulizer oxidant flow, thereby maintaining optimum, constant solution aspiration rates.

The nebulizer

The system uses an adjustable, corrosion-resistant nebulizer.

The standard stainless steel nebulizer is ideal for general, all-round use when a wide variety of sample types is analyzed.

Corrosion-resistant platinum alloy and plastic nebulizers are available as options.

The burner head

Four burner heads are available for the burner system. The burner heads are made of titanium to provide high chemical resistance and good thermal characteristics.

Each burner head can be rotated at an angle in the sample radiation beam. When the burner head is turned at an angle the pathlength of the radiation through the flame is correspondingly shortened. This feature is useful if you are analyzing solutions of high analyte concentration. Positioning notches are located on the burner ring (*see Figure 5-4*).

Each burner head has a magnetic identification strip on the burner ring. This permits the spectrometer to sense which burner head is installed. This prevents the nitrous oxide-acetylene flame from being ignited when an air-acetylene burner head is installed.

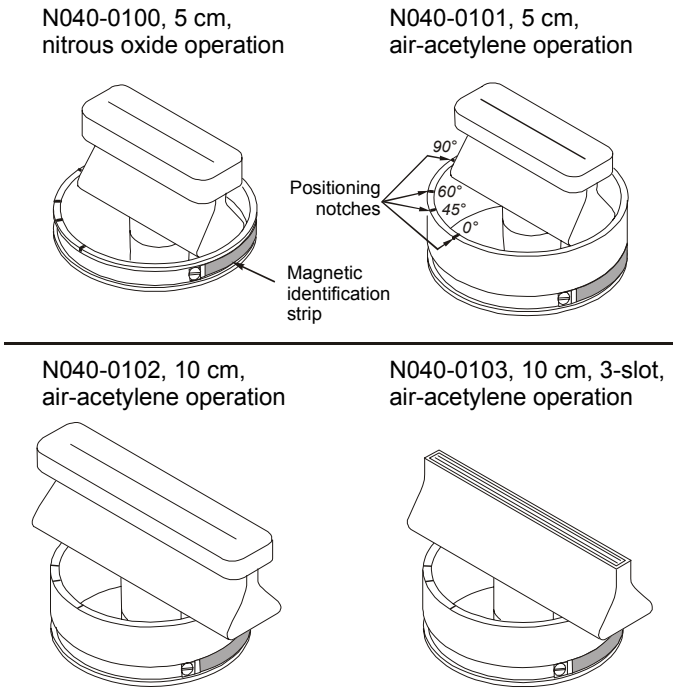

Figure 5-4. The available burner heads

- N040-0100: 5 cm, single-slot burner head for nitrous oxide-acetylene operation.
- N040-0101: 5 cm, single-slot burner head for air-acetylene operation. This burner head is shorter than the standard 10 cm burner head and thus provides reduced sensitivity.
- N040-0102: 10 cm, single-slot burner head for air-acetylene operation. This burner head is provided as standard with the system.
- N040-0103: 10 cm, three-slot burner head for air-acetylene operation. This burner head is designed for the analysis of solutions with high dissolved solids content. Solution can be aspirated for long periods without the burner slot becoming clogged.

The flame igniter

The flame igniter assembly includes the components to automatically ignite the flame, the burner head sensor which checks that a burner head is installed, and the flame detector which monitors the flame.
When the igniter is activated the igniter arm swings over the burner head and a glow plug is energized. Burner gases pass into the igniter tube and are ignited by the glow plug, thus igniting the flame.

The gas controls

The gas controls provide control of the flowrates of the fuel gas (acetylene) and the oxidant (air or nitrous oxide).
The spectrometer incorporates PerkinElmer's TotalFlow gas controls to ensure reproducibility and ease of operation. The total oxidant and fuel flowrates are controlled so that the fuel-to-oxidant ratio is constant, independent of fluctuations in the gas pressure.
You select the gas flowrates and optimize the flame via the AA WinLab software.
The gas control system is incorporated in the spectrometer. The system includes safety interlocks for the flame. If the fuel or oxidant pressure falls below a minimum value the flame is shut down in a safe sequence.
The system also includes automatic sequencing of the gases when the nitrous oxide-acetylene flame is ignited or extinguished.

The burner will be shut down in a safe sequence in the event of a power failure.

The drain system

During flame operation measurement solution that condenses out in the spray chamber runs to waste down the drain tube and is collected in the drain vessel.

The drain vessel includes an internal trap to make certain that back pressure is applied to the spray chamber. This ensures that a fuel/oxidant mixture cannot enter the drain vessel. There are two magnetically activated, hermetically sealed reed float switches in the drain vessel that shut down the flame if the drain system is not functioning properly. One float switch monitors the liquid level in the trap while the other monitors the liquid level in the drain vessel. If the liquid level in the trap is too low or if the liquid level in the waste vessel is too high, the appropriate switch is activated and the flame is shut down.

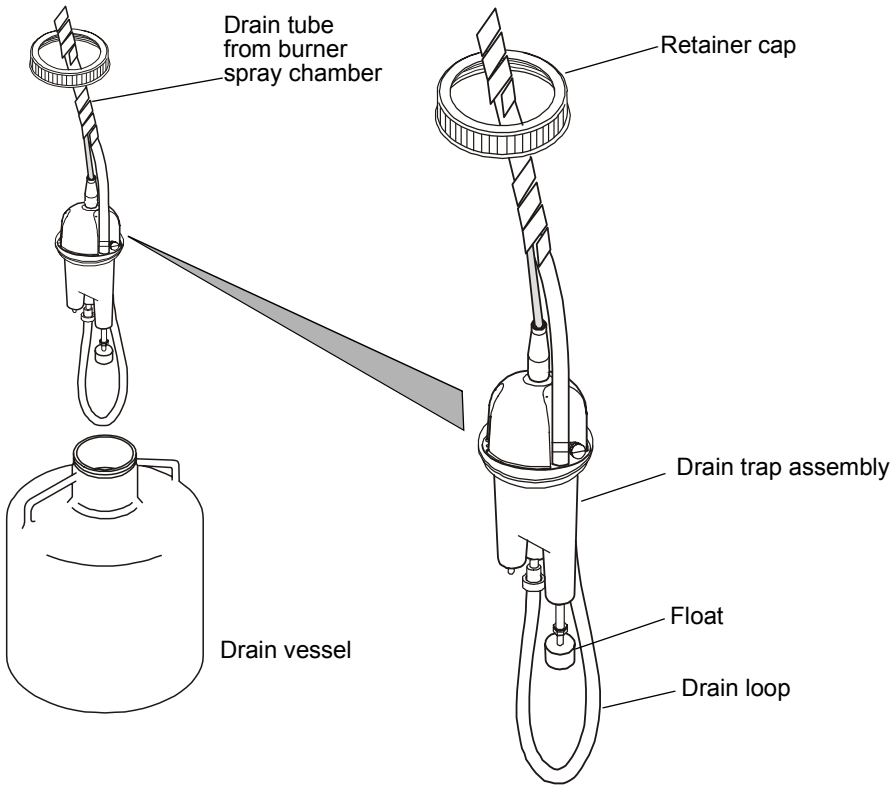

Figure 5-5. The burner drain system

Translations of Warnings 6

Warning Messages

This section contains translations of the safety conventions and warnings used in this guide.

dansk — ***Oversættelser af advarsler***

Denne del indeholder oversættelserne af de advarsler, som er indeholdt i denne håndbog.

Deutsch — ***Übersetzungen der Warnungen***

Dieser Abschnitt enthält die Übersetzungen der in diesem Handbuch verwendeten Warnungen.

español — ***Traducciones de las advertencias***

Esta sección contiene traducciones de las advertencias utilizadas en el presente manual.

italiano — ***Traduzione dei simboli di avvertenza***

La presente sezione contiene la traduzione dei simboli di avvertenza utilizzati nel presente manuale.

Nederlands — ***Vertalingen van de Waarschuwingen***

Dit gedeelte bevat vertalingen van de waarschuwingen gebruikt in dit handboek.

português — ***Traduções de avisos***

Esta secção contém traduções dos avisos usados no manual.

suomea — ***Varoitusten käännökset***

Tämä osa sisältää tässä käsikirjassa käytettyjen varoitusten käännökset.

svenska — ***Översättning av varningstexter***

Detta avsnitt innehåller översättningar av de varningstexter som används i handboken.

W1.2

Warning: Unauthorized Adjustments and Servicing

Only a PerkinElmer service engineer or similarly trained and authorized person should be permitted to service the instrument.

- *Do not attempt to make adjustments, replacements, repairs, or modifications to this instrument except as described in the documentation supplied with the instrument.*

dansk

Advarsel: Ikke-tilladte indstillinger og arbejder på apparatet

Vedligeholdelse af apparatet er kun tilladt for PerkinElmer kundeservice-ingeniøren eller tilsvarende uddannede og autoriserede personer.

- *Prøv ikke på at foretage indstillinger, udskiftninger, reparationer eller ændringer af apparatet, som ikke er beskrevet i den dokumentation, der er vedlagt apparatet.*

Deutsch

Warnung: Unzulässige Arbeiten am Gerät

Wartungs- oder Reparaturarbeiten oder Justierungen, die in der Benutzerdokumentation zum Gerät nicht beschrieben sind, dürfen nur vom PerkinElmer Kundendienst oder von entsprechend ausgebildeten und autorisierten Fachkräften ausgeführt werden.

español

Advertencia: Ajustes y servicios sin autorización

Tan sólo un ingeniero de Servicio Técnico de PerkinElmer o una persona de formación y autorización similares podrán realizar trabajos de revisión y mantenimiento del instrumento.

- *No intente realizar ningún tipo de ajuste, sustitución o reparación en este aparato, a excepción de lo descrito en la Documentación del Usuario que se adjunta.*

français

Danger: Réglages et entretien non autorisés

Seul un ingénieur du service après vente PerkinElmer ou une personne autorisée et de même formation sont autorisées à intervenir sur l'instrument.

- *Ne pas essayer d'effectuer des réglages, des remplacements, des réparations ou des modifications sur cet instrument d'une manière autre que celle décrite dans la documentation fournie avec l'instrument.*

→

	→ ***Warning*** *(continued)* W1.2
italiano	***Pericolo: Regolazioni e manutenzione non autorizzati*** *L'asservimento dello strumento è permesso esclusivamente ad un tecnico di assistenza della PerkinElmer oppure da simile persona addestrata e autorizzata.* • *Non provare ad eseguire regolazioni, sostituzioni, riparazioni o modifiche a questo strumento se non come descritto nella documentazione allegata allo strumento.*
Nederlands	***Waarschuwing: Ongeautoriseerde aanpassingen en service*** *Alleen een PerkinElmer service-monteur of een gelijksoortig opgeleid en geautoriseerd persoon mag service verlenen aan het instrument.* • *Probeer niet zelf aanpassingen aan dit instrument aan te brengen, het te repareren of te veranderen behalve zoals beschreven in de documentatie die bij het instrument geleverd is.*
português	***Aviso: Trabalhos não permitidos no aparelho*** *Trabalhos de manutenção apenas podem ser executados pelo Serviço Técnico da PerkinElmer ou por pessoal especializado devidamente formado e autorizado.* • *Não tente realizar ajustamentos, substituições, reparações ou modificações neste aparelho que não estejam descritos na documentação fornecida com o aparelho.*
suomea	***Varo: Luvattomat säätö - ja huoltotyöt*** *Laitteen huoltotyöt saa antaa vain PerkinElmer -huoltoteknikoiden tai vastaavasti koulutettujen ja valtuutettujen henkilöiden tehtäväksi.* • *Älä tee muita säätö-, vaihto-, korjaus- tai muutostöitä tässä laitteessa kuin sellaisia, jotka on selostettu laitteen mukana toimitetussa dokumentaatiossa.*
svenska	***Varning: Icke tillåtna arbeten på apparaten*** *Endast servicepersonal från PerkinElmer eller personal med liknande utbildning och behörighet får utföra servicearbeten på apparaten.* • *Underhålls- eller reparationsarbeten, justeringar eller ändringar som inte finns beskrivna i användarmanualen till apparaten får inte utföras.*

W3.4

Warning: UV Radiation – Risk of Eye Damage

The flame, especially the nitrous oxide-acetylene flame, may emit UV radiation which can damage your eyes.

- *Keep the burner door closed when the flame is burning, unless you need to adjust the burner as described in the user documentation.*
- *Always wear UV-absorbing safety glasses when looking at the flame.*

dansk

Advarsel: Ultraviolet stråling – farligt for øjnene

Flammen, især lattergas/acetylen-flammen, kan emittere ultraviolet stråling, som kan forårsage øjenskader.

- *Hold brænderdøren lukket, når flammen brænder, medmindre De er nødt til at justere brænderen som beskrevet i brugervejledningen.*
- *Bær altid beskyttelsesbriller, som absorberer ultraviolet stråling, når De ser ind i flammen.*

Deutsch

Warnung: UV-Strahlung – Gefährdung der Augen

Die Flamme, besonders die Lachgas/Acetylen-Flamme, emittiert UV-Strahlung und kann dadurch Augenschäden verursachen.

- *Halten Sie bei brennender Flamme die Probenraumtür möglichst geschlossen.*
- *Tragen Sie eine Schutzbrille, die die emittierte UV-Strahlung ausreichend absorbiert, wenn Sie in die brennende Flamme schauen.*

español

Advertencia: Radiación ultravioleta – Peligro de daños a los ojos

La llama, especialmente la de óxido nitroso/acetileno, puede emitir radiaciones ultravioletas perjudiciales para los ojos.

- *Mantenga cerrada la puerta del mechero mientras esté ardiendo la llama salvo que usted necesite ajustar el mechero tal como lo especifica la documentación para el usuario.*
- *Al dirigir la vista a la llama, utilice siempre las gafas de seguridad específicas para estos rayos.*

français

Danger: Rayonnement UV

La flamme, en particulier la flamme d'oxyde nitreux/acétylène, peut émettre des UV susceptibles de provoquer des lésions oculaires.

- *Pendant que la flamme brûle, laissez la porte du brûleur fermée. Ne l'ouvrir que si vous devez ajuster le brûleur comme décrit dans la documentation utilisateur.*
- *Toujours porter des lunettes de protection absorbant les UV pour regarder la flamme.*

→

	→ ***Warning*** *(continued)* W3.4
italiano	***Pericolo: Radiazioni UV – Rischio di lesioni agli occhi*** *La fiamma, specialmente la fiamma a protossido d'azozo/acetilene, può emettere radiazioni UV che possono lesionare gli occhi.* • *Mentre la fiamma è attiva tenere chiuso il portello del bruciatore se non che per regolare il bruciatore come descritto nella documentazione per l'operatore.* • *Quando guardate nella fiamma indossate sempre occhiali di sicurezza in grado di assorbire le radiazioni UV.*
Nederlands	***Waarschuwing: Ultraviolette straling – Risico's voor de ogen*** *De vlam, in het bijzonder de lachgas/acetyleenvlam, emitteert UV-straling en kan daardoor letsel aan de ogen veroorzaken.* • *Houdt bij brandende vlam de branderdeur gesloten, tenzij de brander bijgesteld moet worden zoals in de gebruikers handleiding beschreven.* • *Draag altijd een veiligheidsbril, die de geëmitteerde UV-straling voldoende absorbeert, wanneer U in de brandende vlam moet kijken.*
português	***Aviso: Radiação UV – perigo para os olhos*** *A chama, especialmente a chama de óxido nitroso/acetileno emite radiações UV podendo assim provocar ferimentos aos olhos.* • *Mantenha a porta do queimador fechada enquanto a chama estiver acesa, a não ser que seja necessário ajustar o queimador conforme descrito na documentação do usuário.* • *Use óculos de protecção que absorvam suficientemente a radiação UV emitida ao olhar directamente para a chama.*
suomea	***Varo: UV-säteily – silmävammojen vaara*** *Liekki, erityisesti ilokaasu/asetyleeni-liekki, saattaa lähettää UV-säteilyä, joka voi vahingoittaa silmiä.* • *Pidä poltinkammion luukku kiinni liekin palaessa, ellei Sinun tarvitse säätää poltinta, kuten käyttäjädokumentaatiossa on selostettu.* • *Käytä aina UV-säteilyltä suojaavia suojasilmälaseja, kun katsot liekkiin.*
svenska	***Varning: UV-strålning – risk för ögonskador*** *Lågor, framför allt lustgas/acetylenlågor alstrar UV-strålning som kan ge ögonskador.* • *Låt brännarens dörr vara stängd så länge lågan brinner, om inga justeringar måste utföras enligt anvisningarna i användarmanualen.* • *Använd alltid skyddsglasögon som absorberar UV-strålar när du tittar in i lågan.*

W4.2

Warning: High Temperatures – Risk of Burns
The burner head can reach very high temperatures.
- *Do not touch the burner head until it has cooled to room temperature.*

dansk	***Advarsel: Høje temperaturer – Fare for forbrændinger*** *Brænderhovedet kan opnå meget høje temperaturer.* • *Berør aldrig brænderhovedet, før det er kølet ned til stuetemperatur.*
Deutsch	***Warnung: Verbrennungsgefahr*** • *Den heißen Brennerkopf nur mit hitzebeständigen Schutzhandschuhen anfassen oder vor dem Anfassen auf Körpertemperatur abkühlen lassen.*
español	***Advertencia: Altas temperaturas – Riesgo de quemaduras*** *La cabeza del mechero puede alcanzar temperaturas muy altas.* • *Asegúrese, antes de tocar el mechero, que éste se haya enfriado hasta alcanzar la temperatura ambiente.*
français	***Danger: Températures élevées – Risque de brûlures*** *La tête de brûleur peut atteindre de très hautes températures.* • *Ne pas toucher la tête de brûleur avant qu'elle ait refroidi à la température ambiante.*
italiano	***Pericolo: Alte temperature – Rischio di ustioni*** *La testa del bruciatore può raggiungere temperature estremamente elevate.* • *Non toccare la testa del bruciatore sino a che non si è raffreddato sino a raggiungere temperatura ambiente.*
Nederlands	***Waarschuwing: Hoge temperaturen – Verbrandingsgevaar*** *De branderkop kan zeer hoge temperaturen bereiken.* • *Raak de branderkop pas aan als hij tot kamertemperatuur is afgekoeld.*
português	***Aviso: Altas temperaturas – perigo de queimaduras*** *A cabeça do queimador pode alcançar temperaturas muito altas.* • *Não toque na cabeça do queimador até ter alcançado a temperatura.*
suomea	***Varo: Korkeat lämpötilat – palovammavaara*** *Polttimen pää voi saavuttaa korkeita lämpötiloja.* • *Älä kosketa polttimen päätä, ennen kuin se on jäähtynyt huoneenlämpötilaan.*
svenska	***Varning: Höga temperaturer – risk för brännskador*** *Brännaren kan nå mycket höga temperaturer.* • *Vidrör inte brännarmunstycket förrän det har svalnat till rumstemperatur.*

W5.3

Warning: Flammable Gases – Fire and Explosion Hazard

- *Before you ignite the flame, set up your spectrometer and burner correctly and observe all the safety precautions described in your spectrometer handbook.*

dansk

Advarsel: Brændbare gasarter – Eksplosions- og brandfare

- *Inden flanmen tændes, skal spektrometret og brænderen forberedes forskriftsmæssigt, og alle sikkerhedshenvisningerne, som er beskrevet i håndbogen til spektrometret, skal overholdes.*

Deutsch

Warnung: Brennbare Gase – Explosions- und Brandgefahr

- *Vor dem Zünden der Flamme Spektrometer und Brennereinheit unter Beachtung aller Sicherheitshinweise ordnungsgemäß vorbereiten wie im Gerätehandbuch beschrieben.*

español

Advertencia: Gases inflamables – Peligro de incendio y explosión

- *Antes de encender la llama, ajuste correctamente el espectrómetro y el mechero, tomando todas las medidas de precaución descritas en el manual del equipo.*

français

Danger: Gaz inflammables – Risque d'incendie et d'explosion

- *Avant d'allumer la flamme, régler correctement le spectromètre et le brûleur et observer toutes les consignes de sécurité décrites dans le manuel du spectromètre.*

italiano

Pericolo: Gas infiammabili – Pericolo di incendio e di esplosione

- *Prima di accendere la fiamma impostate lo spettrometro e il bruciatore in maniera corretta osservando tutte le misure di sicurezza descritte nel manuale dello spettrometro.*

Nederlands

Waarschuwing: Brandbare gassen – Gevaar voor brand en explosie

- *Voordat de vlam wordt ontstoken moeten de spectrometer en de branderunit op de juiste manier en met inachtneming van de veiligheidsvoorschriften zoals deze in de handleiding van het instrument staan vermeld, worden voorbereid.*

português

Aviso: Gases inflamáveis – perigo de incêndio e de explosão

- *Antes de acender a chama, preparar devidamente o espectrómetro e a unidade queimadora respeitando todas as instruções de segurança referidas no manual do espectrómetro.*

suomea

Varo: Syttyvät kaasut – tulipalo- ja räjähdysvaara

- *Ennen kuin sytytät liekin, aseta sspektrometri ja poltin oikein ja ota huomioon kaikki spektrometrin käsikirjassa annetut turvaohjeet.*

svenska

Varning: Brännbara gaser – explosions- och brandfara

- *Innan lågan tänds skall spektrometern och brännarenheten förberedas enligt anvisningarna i användarmanualen. Följ säkerhetsföreskrifterna.*

W5.7

Warning: Acetylene – Explosion Hazard
Acetylene can decompose explosively at pressures higher than 103 kPa / 1.03 bar / 15 psig.
- *Always make sure that the acetylene outlet gauge pressure is below this value.*

dansk

Advarsel: Acetylen – Eksplosionsfare
Acetylen kan nedbrydes eksplosionsagtigt ved tryk over 103 kPa / 1.03 bar / 15 psig.
- *Forvis Dem altid om, at acetylen-udgangsmåletrykket ligger under denne værdi.*

Deutsch

Warnung: Acetylen – Explosionsgefahr
- *Stellen Sie für Acetylen keinen höheren Ausgangsdruck als 103 kPa (1,03 bar) ein. Bei höheren Drücken kann Acetylen spontan zerfallen und explodieren.*

español

Advertencia: Acetileno – Peligro de explosión
El acetileno puede descomponerse y ocasionar explosiones a presiones superiores a 103 kPa / 1.03 bar / 15 psig.
- *Tenga cuidado siempre de mantener la presión del manómetro de acetileno por debajo de este valor.*

français

Danger: Acétylène – Risque d'explosion
L'acétylène peut se décomposer de manière explosive à des pressions supérieures à 103 kPa / 1.03 bar / 15 psig.
- *Toujours vérifier que la pression de l'acétylène sur le manomètre de sortie est inférieure à cette valeur.*

→

	→ ***Warning*** *(continued)* W5.7
italiano	***Pericolo: Acetilene – Pericolo di esplosione*** *L'acetilene può decomporsi in maniera esplosiva a pressioni superiori a 103 kPa / 1.03 bar / 15 psig.* • *Assicuratevi sempre che la lancetta del manometro di uscita dell'acetilene rimanga al di sotto di tali valori.*
Nederlands	***Waarschuwing: Acetyleen – Explosiegevaar*** *Acetyleen kan spontaan ontbinden bij een druk hoger dan 103 kPa / 1.03 bar / 15 psig.* • *Zorg er altijd voor dat de druk van de acetyleen-uitlaatmeter niet boven deze waarde uitkomt.*
português	***Aviso: Acetileno – perigo de explosão*** *Se a pressão for superior a 103 kPa / 1.03 bar / 15 psig, o acetileno poderá desintegra-se de repente e explodir.* • *Assegure-se de que o manómetro de pressão de saída do acetileno indica sempre uma pressão inferior a este valor.*
suomea	***Varo: Asetyleeni – räjähdysvaara*** *Asetyleeni voi hajota räjähdyksenomaisesti, jos paine on suurempi kuin 103 kPa (1.03 bar).* • *Varmistu aina siitä, että asetyleenin lähtöpaine painemittarissa on alle tämän arvon.*
svenska	***Varning: Acetylen – explosionrisk*** *Acetylen får inte utsättas för högre tryck än 103 kPa / 1,03 bar / 15 psig. Vid högre tryck bryts acetylenet ned och kan explodera.* • *Se till att utgångstrycket för acetylen ligger under detta värde.*

W5.10

Warning: Flammable Gases – Fire and Explosion Hazard
The use of the wrong type of nebulizer for your burner system may result in a seepage of fuel gas which is a serious fire hazard.
- *Use only the nebulizers specified for the burner system.*

dansk

Advarsel: Brændbare gasarter – Eksplosions- og brandfare
Brugen af en forkert forstøvertype til Deres brændersystem kan medføre udslip af brændselsgas, som udgør en alvorlig brandfare.
- *Benyt kun de forstøvere, som er beregnet til brændersystemet.*

Deutsch

Warnung: Brennbare Gase – Explosions- und Brandgefahr
Bei Verwendung eines falschen Zerstäubertyps im Brennersystem kann Brenngas austreten, was Brandgefahr zur Folge hat.
- *Verwenden Sie nur die für das Brennersystem zulässigen Zerstäubertypen.*

español

Advertencia: Escapes de gas – Peligro de incendio y explosión
El uso del tipo inadecuado de nebulizador en su sistema de mecheros puede ocasionar un escape de gas combustible, lo que entraña un grave peligro de incendio.
- *Use únicamente el nebulizador especificado para el sistema de mecheros.*

français

Danger: Gaz inflammables – Risque d'incendie et d'explosion
L'emploi d'un mauvais type de nébuliseur pour votre système de brûleur peut entraîner une infiltration de gaz de combustion qui constitue un grave risque d'incendie.
- *N'utiliser que les nébuliseurs spécifiés pour le système de brûleur.*

→

	→ ***Warning*** *(continued)* W5.10
italiano	***Pericolo: Gas infiammabili – Pericolo di incendio e di esplosione*** *L'uso di un errato tipo di nebulizzatore nel vostro sistema di combustione può causare l'infiltrazione di gas del combustibile provocando un forte rischio di incendio.* • *Utilizzate esclusivamente i nebulizzatori specifici per il vostro sistema di combustione.*
Nederlands	***Waarschuwing: Brandbare gassen – Gevaar voor brand en explosie*** *Gebruik van de verkeerde soort verstuiver voor de branders kan leiden tot lekkage van stookgas hetgeen ernstig brandgevaar oplevert.* • *Gebruik uitsluitend de verstuivers die voor de branders zijn aangegeven.*
português	***Aviso: Gases inflamáveis – perigo de incêndio e de explosão*** *A utilização do tipo errado de pulverizador para o seu sistema de queimador poderá causar uma fuga de gás, o que constitui um perigo de incêndio eminente.* • *Use apenas os pulverizadores especificados para o sistema de queimador.*
suomea	***Varo: Syttyvät kaasut – tulipalo- ja räjähdysvaara*** *Jos poltinjärjestelmässä käytetään vääräntyyppistä sumutinta, seurauksena voi olla polttoainekaasun vuotaminen, mikä merkitsee vakavaa tulipalovaaraa.* • *Käytä ainoastaan sumuttimia, jotka on määrätty poltinjärjestelmälle.*
svenska	***Varning: Brännbara gaser – explosions- och brandfara*** *Användning av fel spridarmunstycke till brännarsystemet kan orsaka gasläckage, vilket ökar brandrisken.* • *Använd endast spridarmunstycken som är tillverkade för det aktuella brännarsystemet.*

W8.6

Warning: Hydrochloric Acid – Risk of Burns

Hydrochloric acid (HCl) *is corrosive and can cause severe burns.*

- *When using hydrochloric acid, always wear suitable protective clothing including a face mask, work in a fume hood, and observe the manufacturer's instructions and your local safety regulations.*

dansk

Advarsel: Saltsyre – Fare for ætsninger

Saltsyre (HCl) *er korrosiv og kan forårsage alvorlige ætsninger.*

- *Under håndteringen af saltsyre skal man altid bære tilsvarende beskyttelsestøj, inklusive ansigtsbeskyttelse, arbejde i et aftræk samt overholde producentens henvisninger og de stedlige sikkerhedsforskrifter.*

Deutsch

Warnung: Salzsäure – Verätzungsgefahr

Salzsäure (HCl) *ist stark ätzend und korrosiv.*

- *Tragen Sie beim Umgang mit Salzsäure eine Schutzbrille oder Gesichtsschutz, Schutzhandschuhe und säurebeständige Schutzkleidung und arbeiten Sie in einem Abzug. Beachten Sie die Gefahrenhinweise und Sicherheitsratschläge des Herstellers.*

español

Advertencia: Ácido clorhídrico – Peligro de quemaduras

El ácido clorhídrico (HCl) *es* corrosivo *y puede causar quemaduras graves.*

- *Al usar este ácido, utilice siempre ropa de protección incluyendo una máscara facial; trabaje en la campana de humos y siga las instrucciones del fabricante y las reglas de seguridad nacionales.*

français

Danger: Acide chlorhydrique – Risque de brûlures

L'acide chlorhydrique (HCl) *est corrosif et susceptible de provoquer de graves brûlures.*

- *Lors de l'utilisation d'acide chlorhydrique, toujours porter une tenue protectrice appropriée comportant un masque, travailler dans une hotte fermée et respecter les instructions du fabricant et les règlements de sécurité de l'entreprise.*

→

	→ ***Warning*** *(continued)* W8.6
italiano	***Pericolo: Acido cloridrico – Rischio di ustioni*** *L'acido cloridrico* (HCl) *è corrosivo e può causare severe ustioni.* • *Se utilizzate acido cloridrico indossate sempre indumenti protettivi comprendenti una maschera, lavorate in una cappa per fumi e osservate le istruzioni del produttore cosìccome le norme di sicurezza vigenti localmente.*
Nederlands	***Waarschuwing: Chloorwaterstofzuur – Etsingsgevaar*** *Chloorwaterstofzuur* (HCl) *is corrosief en sterk etsend.* • *Draag tijdens het gebruik van chloorwaterstofzuur een veiligheidsbril of gezichtsmasker, veiligheidshandschoenen en zuurbestendige veiligheidskleding en werk in een ruimte waarin wordt afgezogen. Neem de risicorichtlijnen en de veiligheidsvoorschriften van de fabrikant en die ter plaatse in acht.*
português	***Aviso: Ácido hidroclórico – perigo de queimaduras*** *Ácido hidrclórico* (HCl) *é corrosivo e pode causar queimaduras graves.* • *Ao lidar com ácido hidroclórico, use sempre vestuário de protecção, incluindo uma máscara de protecção, trabalhe dentro de um exaustor, e respeite as instruções do fabricante bem como as regulamentações locais em matéria de segurança.*
suomea	***Varo: Suolahappo – vaarana syöpymisvammat*** *Suolahappo* (HCl) *on syövyttävää ja voi aiheuttaa vakavia syöpymisvammoja.* • *Kun käsittelet suolahappoa, käytä aina sopivaa suojavaatetusta, johon kuuluu myös naamari, työskentele vetokaapissa ja ota huomioon valmistajan antamat ohjeet ja paikalliset turvamääräykset.*
svenska	***Varning: Saltsyra – risk för brännskador*** *Saltsyra* (HCl) *är frätande och kan ge svåra brännskador.* • *Använd alltid skyddskläder och skyddsmask vid hantering av saltsyra och arbeta under en utsugningshuv. Följ tillverkarens instruktioner och de lokala säkerhetsföreskrifterna.*

W9.1

Warning: Moving Parts – Risk of Injury
Some moving parts of the instrument are accessible in normal operation.
- *Keep hands, clothing and other objects away from the moving parts of the instrument.*

dansk	***Advarsel: Bevægelige dele – Fare for kvæstelser*** *Nogle af apparatets bevægelige dele er tilgængelige ved normal betjening.* • *Hold hænder, tøj og andre genstande borte fra apparatets bevægelige dele.*
Deutsch	***Warnung: Bewegliche Teile – Verletzungsgefahr*** *Bei normalem Betrieb sind bewegliche Teile des Geräts zugänglich.* • *Hände, Kleidung und andere Gegenstände von den beweglichen Teilen des Geräts fernhalten.*
español	***Advertencia: Peligro mecánico*** *Algunas de las partes móviles del aparato son accesibles durante su funcionamiento normal.* • *Mantenga las manos, la ropa y otros objetos alejados de las partes móviles del equipo.*
français	***Danger: Parties en mouvement – Risque d'accident corporel*** *Certaines parties en mouvement de l'instrument sont accessibles en fonctionnement normal.* • *Tenir les mains, vêtements et autres objets éloignés des parties en mouvement de l'instrument.*

→

	→ ***Warning*** *(continued)* W9.1
italiano	***Pericolo: Parti in movimento – Pericolo di infortunio*** *Alcune delle parti in movimento dello strumento sono accessibili anche durante il normale funzionamento.* • *Tenete le mani, gli indumenti e altri oggetti lontano dalle parti in movimento dello strumento.*
Nederlands	***Waarschuwing: Bewegende delen – Verwondingsgevaar*** *Sommige bewegende delen van het instrument kunnen aangeraakt worden tijdens de normale werking.* • *Handen, kleding en andere voorwerpen uit de buurt van de bewegende delen van het instrument houden.*
português	***Aviso: Peças móveis – perigo de ferimento*** *Algumas peças móveis do aparelho podem ser acedidas durante o funcionamento normal.* • *Mantenha afastados das peças móveis do aparelho as mãos, o vestuário e outros objectos.*
suomea	***Varo: Liikkuvat osat – loukkaantumisvaara*** *Muutamiin laitteen liikkuviin osiin on mahdollista päästä käsiksi normaalikäytön aikana.* • *Pidä kädet, vaatteet ja muut esineet loitolla laitteen liikkuvista osista.*
svenska	***Varning: Rörliga delar – risk för skador*** *En del rörliga delar på apparaten är åtkomliga vid normal användning.* • *Se till att händer, kläder eller andra föremål inte kommer i närheten av apparatens rörliga delar.*

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Customer Service

Company Name and Addresses

U.S.A.:
PerkinElmer LLC
761 Main Avenue
Norwalk, Connecticut 06859-0010
U.S.A.
Phone: 800-762-4000 or
(+1) 203-762-4000
Fax: (+1) 203-762-4228

Germany:
PerkinElmer
Verkauf und Service
Rengoldshauser Strasse 11
88662 Ueberlingen
Germany
Phone: (49-7551) 919-0
Fax: (49-7551) 919-149

United Kingdom:
PerkinElmer Ltd.
Post Office Lane
Beaconsfield, Bucks, HP9 1QA
England
Phone: (44-1494) 676161
Fax: (44-1494) 67-9331 & -9333

PerkinElmer on the Internet:
http://www.perkinelmer.com

Supplies, replacement parts, and accessories

Supplies, replacement parts, and accessories can be ordered directly from PerkinElmer, using the part numbers quoted in the guides provided with the instrument.

PerkinElmer's catalog service offers a full selection of high-quality supplies.

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- If you are located *within the U.S.*, call toll free **1-800-762-4002**, 8 a.m. to 8 p.m. EST. Your order will be shipped promptly, usually within 24 hours.
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PerkinElmer Instruments
761 Main Avenue, Norwalk, CT 06859-0010, U.S.A.,
Tel: 1-800-762-4000 or 1-203-762-4000
Fax: 1-203-762-4228
Internet: http://www.perkinelmer.com

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